CareQuest Institute for Oral Health®

Fluoride & IQ: Separating Fact from Fiction

August 28, 2025

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All lines will be muted to avoid background noise.

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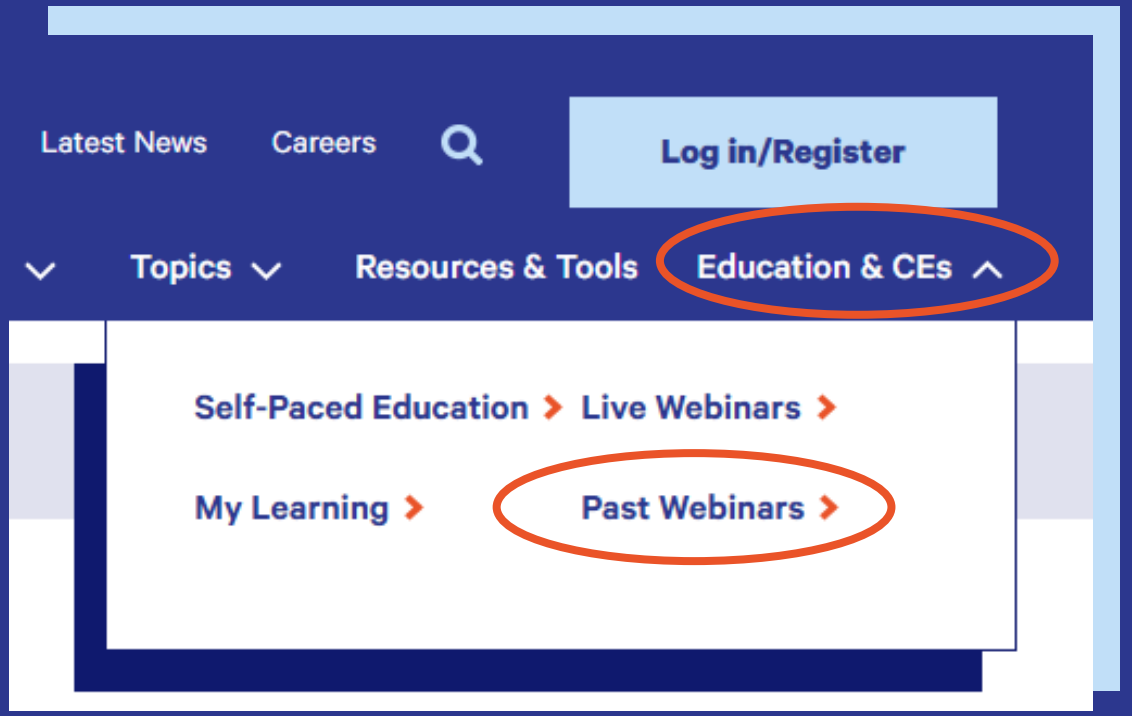

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- We will turn to your questions and comments toward the end of the hour.

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CareQuest Institute for Oral Health

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Webinar

Fluoride and IQ: Separating Fact from Fiction

Thursday
August 28, 2025

7-8 p.m. ET

1 CE Credit

Moderator
Jane Grover, DDS, MPH
American Dental Association

Presenter
Scott L. Tomar, DMD, DrPH
University of Illinois Chicago College of Dentistry

Presenter
Susan Fisher-Owens, MD, MPH, FAAP
University of California, San Francisco

Learning Objectives

- **Describe** the scientific evidence supporting community water fluoridation as a safe and effective public health measure.
- **Describe** the quality of evidence behind claims associating CWF with negative effects on IQ.
- **Discuss** strategies and steps for communicating with patients and the public about the benefits and safety of CWF.

Poll Questions

1. **How confident are you in discussing the safety and effectiveness of fluoride with patients and caregivers?**
   a) Extremely confident
   b) Confident
   c) Somewhat confident
   d) Slightly confident
   e) Not confident

2. **What is your impression of the evidence connecting fluoride exposure and IQ in children?**
   a) The evidence clearly supports a link
   b) The evidence is mixed or inconclusive
   c) The evidence does not support a link
   d) I'm not familiar with the research, I need to learn more

Fluoride and IQ: Separating Fact from Fiction

Scott L. Tomar, DMD, DrPH
Associate Dean for Prevention and Public Health Sciences
UIC College of Dentistry
stomar@uic.edu

CareQuest Webinar
August 28, 2025

Disclosures

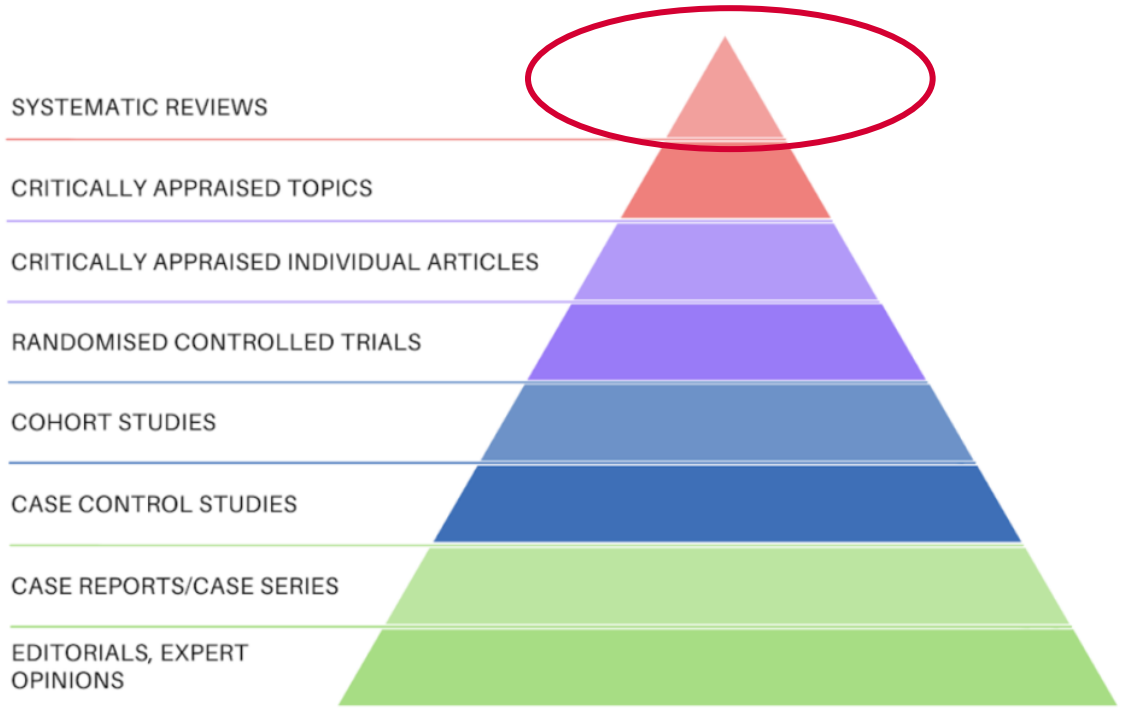
- Member of ADA National Fluoridation Advisory Committee and ADA spokesperson on community water fluoridation (unpaid)
- No financial conflicts to declare
- All opinions expressed are mine and do not necessarily reflect the policies or positions of UIC College of Dentistry, the American Dental Association, or any other organization

Outline

- Effectiveness of community water fluoridation (CWF)
- Brief history on supposed link between CWF and lower IQ

Is Community Water Fluoridation Effective for Caries Prevention?

- Start with the highest-level evidence: systematic reviews (SR)
- SR explicitly poses one or more clinical questions
- High quality systematic reviews specify exact inclusion/exclusion criteria, databas included in search, and search terms
- Rate quality of each study based on susceptibility to various types of bias
- Low-quality studies (i.e., high risk for bias) typically excluded



Systematic Reviews on Effectiveness of Community Water Fluoridation, Past 25 Years

- McDonagh et al. A Systematic Review of Public Water Fluoridation. NHS Centre for Reviews and Dissemination: University of York; 2000.
- The Community Preventive Services Task Force. Preventing Dental Caries: Community Water Fluoridation; 2013.
- Royal Society of New Zealand and the Office of the Prime Minister's Chief Science Advisor. Health effects of water fluoridation: a review of the scientific evidence; 2014. Updated 2021.
- Iheozor-Ejiofor et al. Water Fluoridation for the Prevention of Dental Caries. Cochrane Database; 2015. Updated 2024.
- Sutton et al. Health effects of water fluoridation: an evidence review. Ireland Health Research Board; 2015.
- National Health and Medical Research Council, Australian Government. Information Paper – Water fluoridation: dental and other human health outcomes; 2017.
- Belotti L, Frazão P. Effectiveness of water fluoridation in an upper-middle-income country: A systematic review and meta-analysis. Int J Paediatr Dent. 2022;32(4):503-13.
- Sharma et al. Dental caries in children in Ireland: a systematic review. Community Dent Oral Epidemiol. 2024;52(1):24-38.

2000 University of York Systematic Review

Question: What are the effects of fluoridation of drinking water supplies on the incidence of caries?

- Included 26 studies; all but 3 were controlled before-after studies
- Median difference in % of children caries free: 14.6%
- Median reduction of dmft/DMFT: 2.25 teeth
- **“The best available evidence suggests that fluoridation of drinking water supplies does reduce caries prevalence, both as measured by the proportion of children who are caries free and by the mean change in dmft/DMFT score.”**

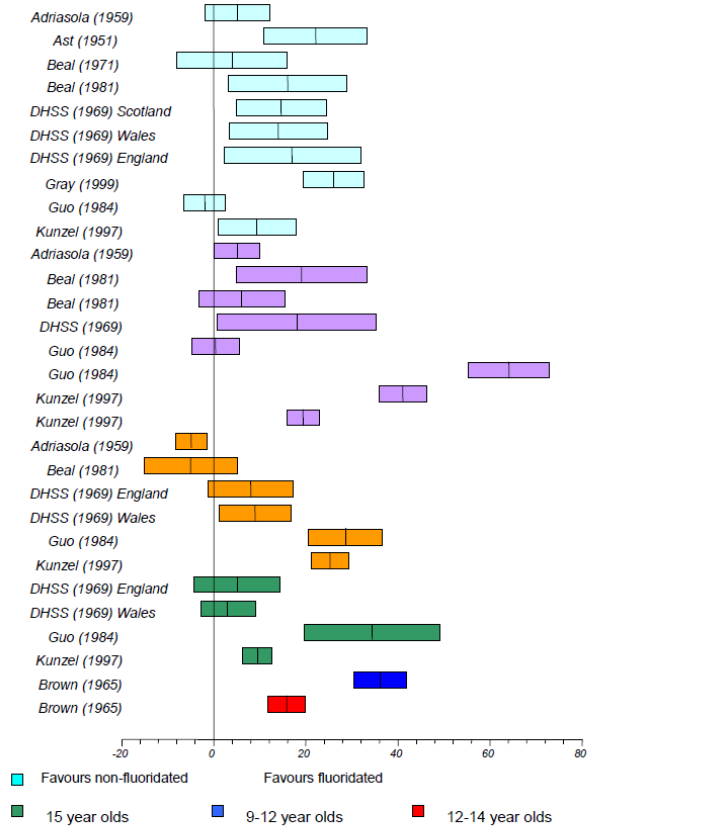


Figure 4.1: Increase in proportion (%) of caries-free children in fluoridated compared to non-fluoridated areas (mean difference and 95% CI)

McDonagh et al. A Systematic Review of Public Water Fluoridation. NHS Centre for Reviews and Dissemination: University of York; 2000. https://www.york.ac.uk/media/crd/crdreport18.pdf

2017 Australian Government Review

Question: What is the effect of water fluoridation (0.4–1.5 ppm F) compared to a non-fluoridated water supply (<0.4 ppm F) on dental caries?

- Included 25 primary studies
- CWF reduces the incidence of dental caries in the deciduous and permanent teeth of children by approximately 35%
- CWF increases proportion of children who have no dental caries by ~ 15%

Jack B et al. Health Effects of Water Fluoridation: Evidence Evaluation Report, report to the National Health and Medical Research Council, Canberra; 2016. https://www.nhmrc.gov.au/sites/default/files/documents/reports/fluoridation-evidence.pdf

Cochrane Review, 2015

- Included only prospective studies with concurrent control that compared ≥ 2 populations: 1 receiving fluoridated water and the other non-fluoridated water; outcome(s) evaluated at ≥ 2 time points (19 studies included)
- 35% reduction in dmft and a 26% reduction in DMFT compared to the median control group mean values
- Noted that most studies (71%) were conducted prior to 1975 and widespread use of fluoride toothpaste

https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010856.pub2/full?highlightAbstract=fluorid%7Cfluoridation

Cochrane Library

Cochrane Database of Systematic Reviews

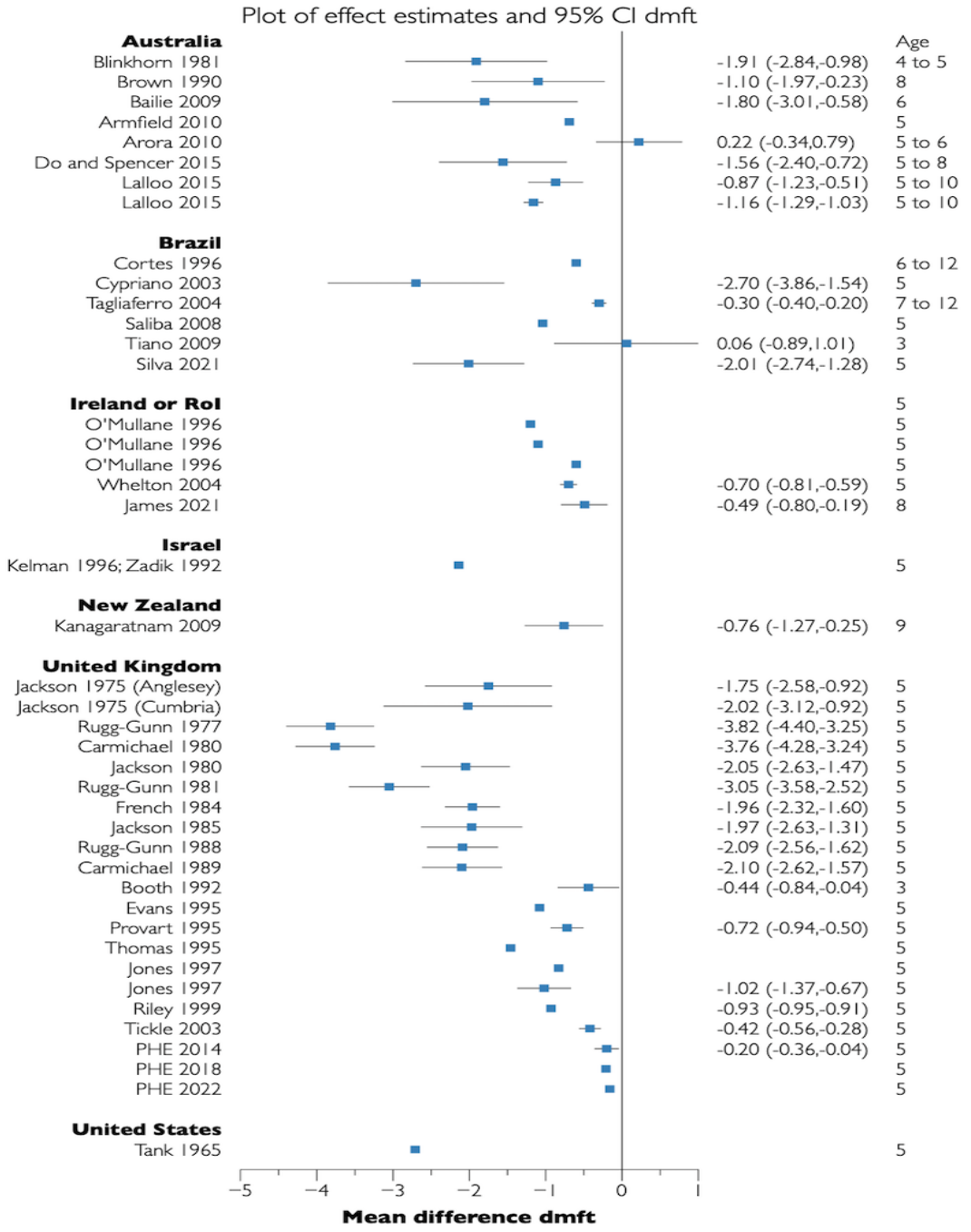
Water fluoridation for the prevention of dental caries (Review)

Iheozor-Ejiofor Z, Walsh T, Lewis SR, Riley P, Boyers D, Clarkson JE, Worthington HV, Glenny AM, O'Malley L

- Systematic review on effects of initiation or cessation of community water fluoridation for caries prevention
- Only added 1 study on effect of initiation to 2015 review
- Widely misinterpreted in popular media as showing CWF no longer effective

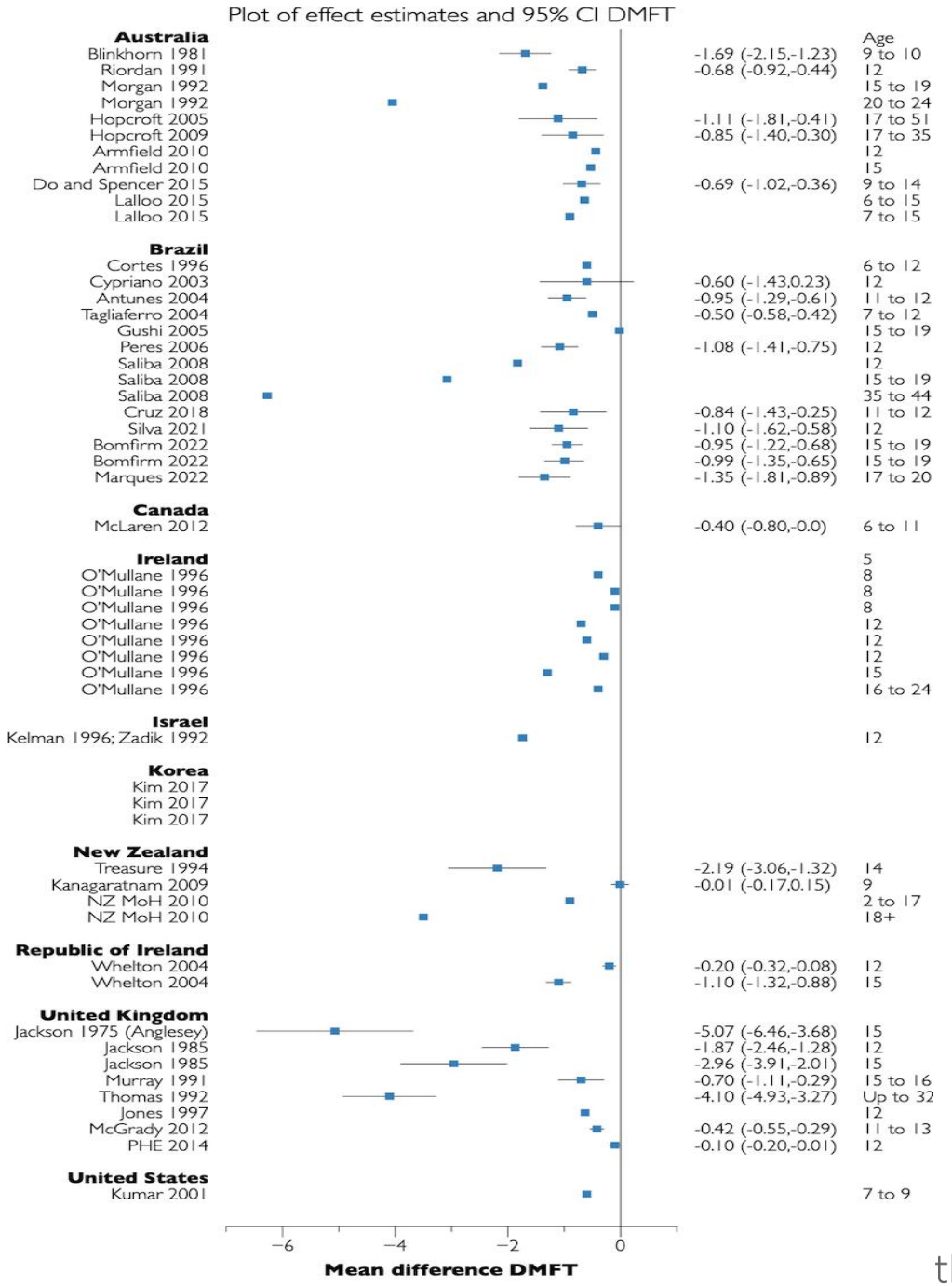
Iheozor-Ejiofor et al. Cochrane Database of Systematic Reviews 2024, Issue 10. Art. No.: CD0108562024.
https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010856.pub3/full#CD010856-sec-0044

Cochrane Review: Cross-sectional Studies on Primary Teeth (dmft)



Iheozor-Ejiofor et al. Cochrane Database of Systematic Reviews 2024, Issue 10. Art. No.: CD0108562024. https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010856.pub3/full#CD010856-sec-0044

Cochrane Review: Cross-sectional Studies on Permanent Teeth (DMFT)



Iheozor-Ejiofor et al. Cochrane Database of Systematic Reviews 2024, Issue 10. Art. No.: CD0108562024. https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010856.pub3/full#CD010856-sec-0044

Is Water Fluoridation Safe?

Fluoridation Opposition

- Started with fluoridation in 1940s
- Communist Conspiracy
- Numerous groups have opposed – John Birch, Ku Klux Klan, Green Project
- Internet has made opposition more mainstream
- Accusations that fluoride causes…thyroid problems, arthritis, osteosarcoma, Down Syndrome, Alzheimer's, HIV/AIDS, heart disease, kidney disease, hip and bone fractures, pineal gland disorders…Neurocognitive effects???

Do you realize that fluoridation is the most monstrously conceived and dangerous communist plot we have ever had to deal with?

Fluoridation and Lower IQ: The Claim *Du Jour*

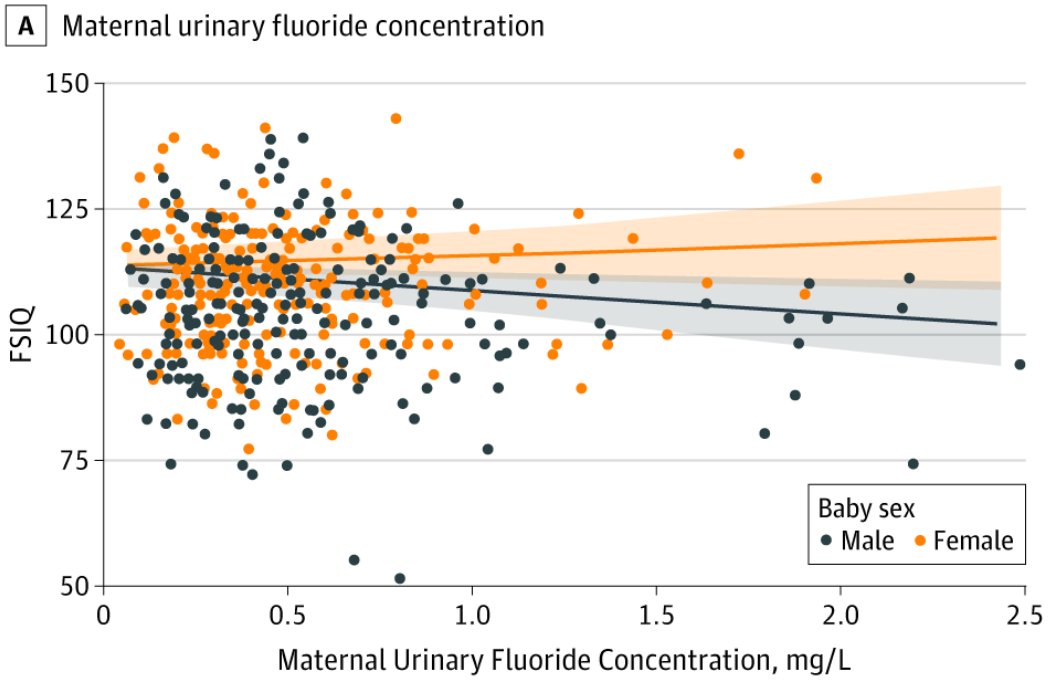
- Claims about effect of fluorides on IQ and neurodevelopment started at least 40 years ago
- Largely ignored because studies were consistency poor quality and conducted in impoverished rural areas in endemic fluorosis regions of China and India
- Gained traction in past several years, particularly due to Canadian MIREC study

The Study that Sparked Most of the Attention on Fluoride and IQ

JAMA Pediatrics | Original Investigation

Association Between Maternal Fluoride Exposure During Pregnancy and IQ Scores in Offspring in Canada

Rivka Green, MA; Bruce Lanphear, MD; Richard Hornung, PhD; David Flora, PhD; E. Angeles Martinez-Mier, DDS; Raichel Neufeld, BA; Pierre Ayotte, PhD; Gina Muckle, PhD; Christine Till, PhD



- Secondary analysis of Canadian birth cohort study
- Measured fluoride in maternal spot urine samples from biobank
- Research assistants measured IQ, age 3
- Overall, no association…so they tested it by sex
- "1-mg/L increase in MUF_{SG} was associated with a 4.49-point lower IQ score (95% CI, −8.38 to −0.60) in boys, but there was no statistically significant association with IQ scores in girls (*B* = 2.40; 95% CI, −2.53 to 7.33)."

Green et al. JAMA Pediatr 2019;173(10):940-8. https://jamanetwork.com/journals/jamapediatrics/fullarticle/2748634

Some of the Major Weaknesses of Green et al. Study

- Spot urine is invalid measure of F exposure
- Poor reliability of IQ measurements
- The regression line does not fit the data very well: primary model accounted for < 5% of variability in IQ
- Authors did not explain why girls' IQ increased with increasing maternal urinary fluoride level
- Investigators have refused to share data with outside investigators

National Toxicology Program (NTP)

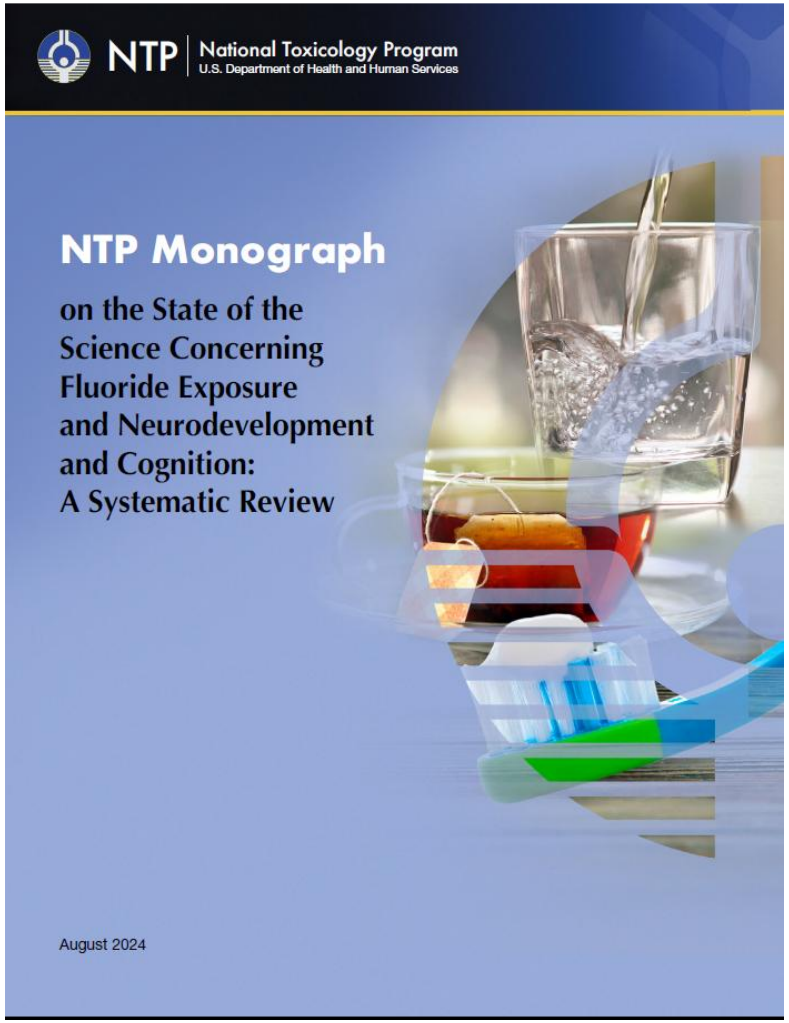
- Due to epidemiologic studies on fluoride and neurodevelopmental or cognitive effects and nomination from anti-fluoridation group, NTP decided in 2019 to conduct systematic review
- To ensure integrity, NTP asked National Academies of Sciences, Engineering, and Medicine (NASEM) to review its monograph
- Extensive criticism by NASEM on first two drafts on methodology, analysis, and conclusions
- NTP bypassed NASEM and selected its own reviewers for final version

https://nap.nationalacademies.org/catalog/25715/review-of-the-draft-ntp-monograph-systematic-review-of-fluoride

https://nap.nationalacademies.org/catalog/26030/review-of-the-revised-ntp-monograph-on-the-systematic-review-of-fluoride-exposure-and-neurodevelopmental-and-cognitive-health-effects

NTP Report on Fluoride and Neurodevelopment

- Included 72 studies on IQ in children
- **53 of those (74%) were judged by authors to be low quality studies at high risk of bias**
- 66 (92%) from China (47), India (15), or Iran (4)
- 19 papers published in non-peer-reviewed, anti-fluoridation journal *Fluoride*
- 13 non-peer-reviewed papers translated from Chinese by Fluoride Action Network, an anti-fluoridation group
- No studies from US

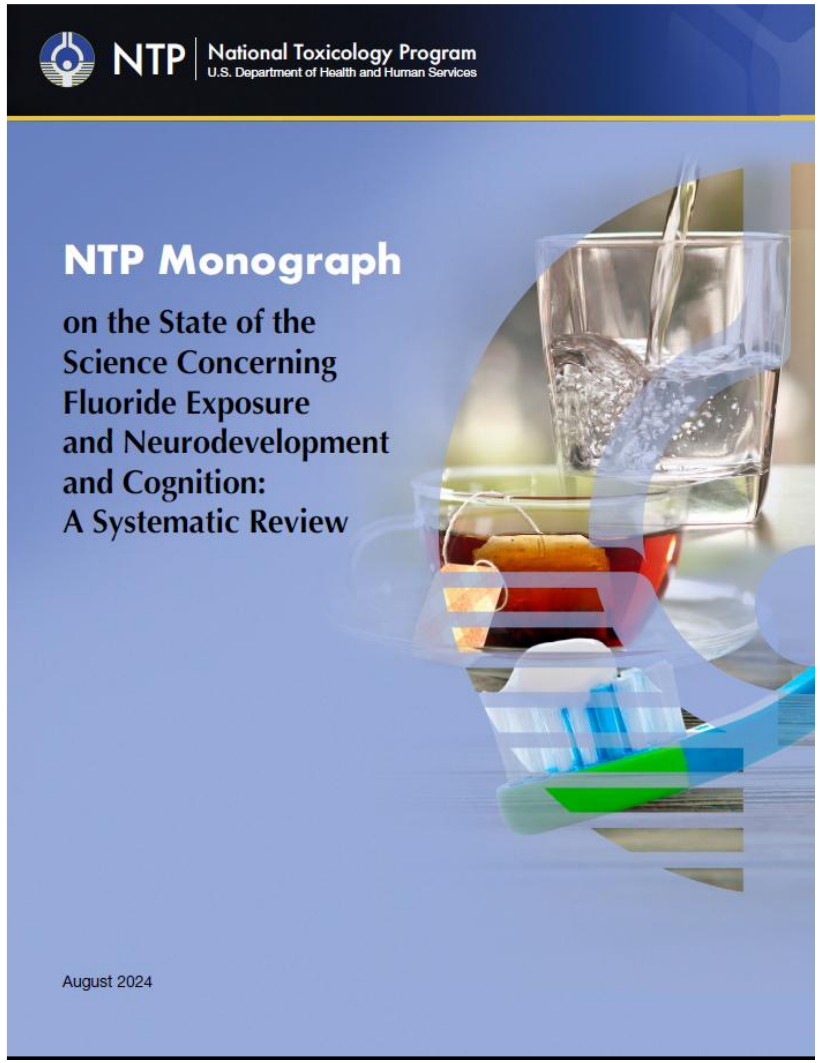


https://ntp.niehs.nih.gov/sites/default/files/2024-08/fluoride_final_508.pdf

NTP Report on Fluoride and Neurodevelopment

The remaining 19 “high quality” studies:

- 16 cross-sectional studies from rural villages in endemic fluorosis regions of China (10), India (3), Mexico (2), and Iran (1)
- 1 cohort study from Mexico (F exposure primarily from fluoridated salt)
- 2 cohort studies from Canada (from same study population)

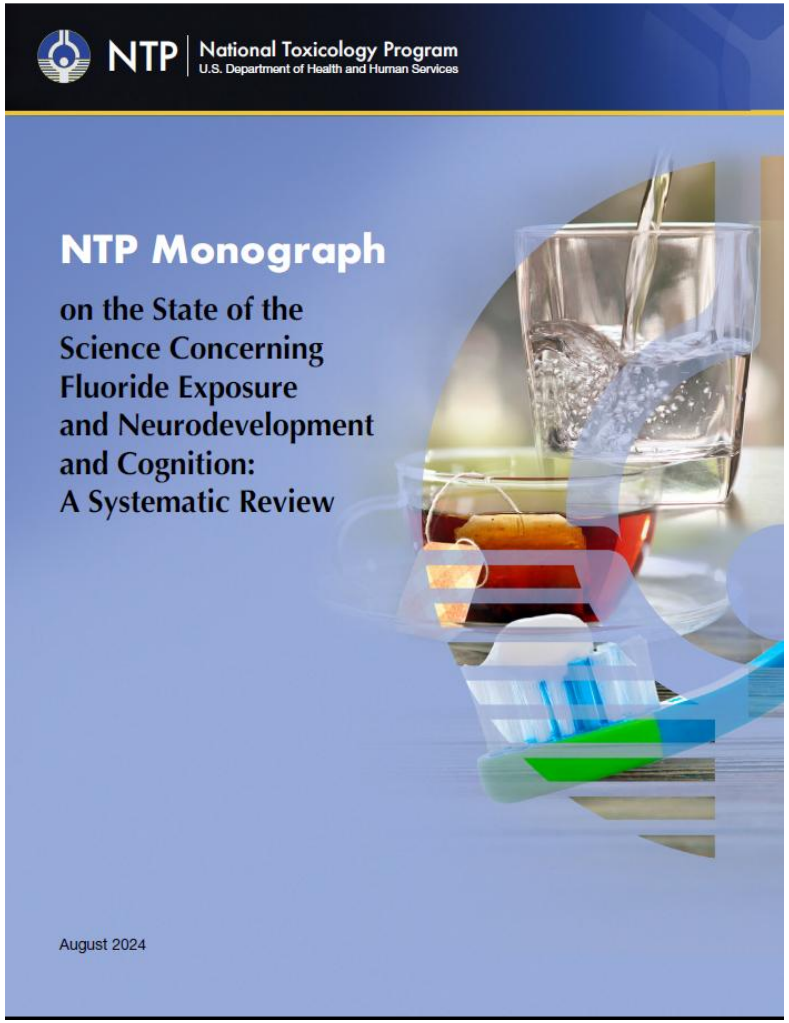


https://ntp.niehs.nih.gov/sites/default/files/2024-08/fluoride_final_508.pdf

Final NTP Report on Fluoride and Neurodevelopment

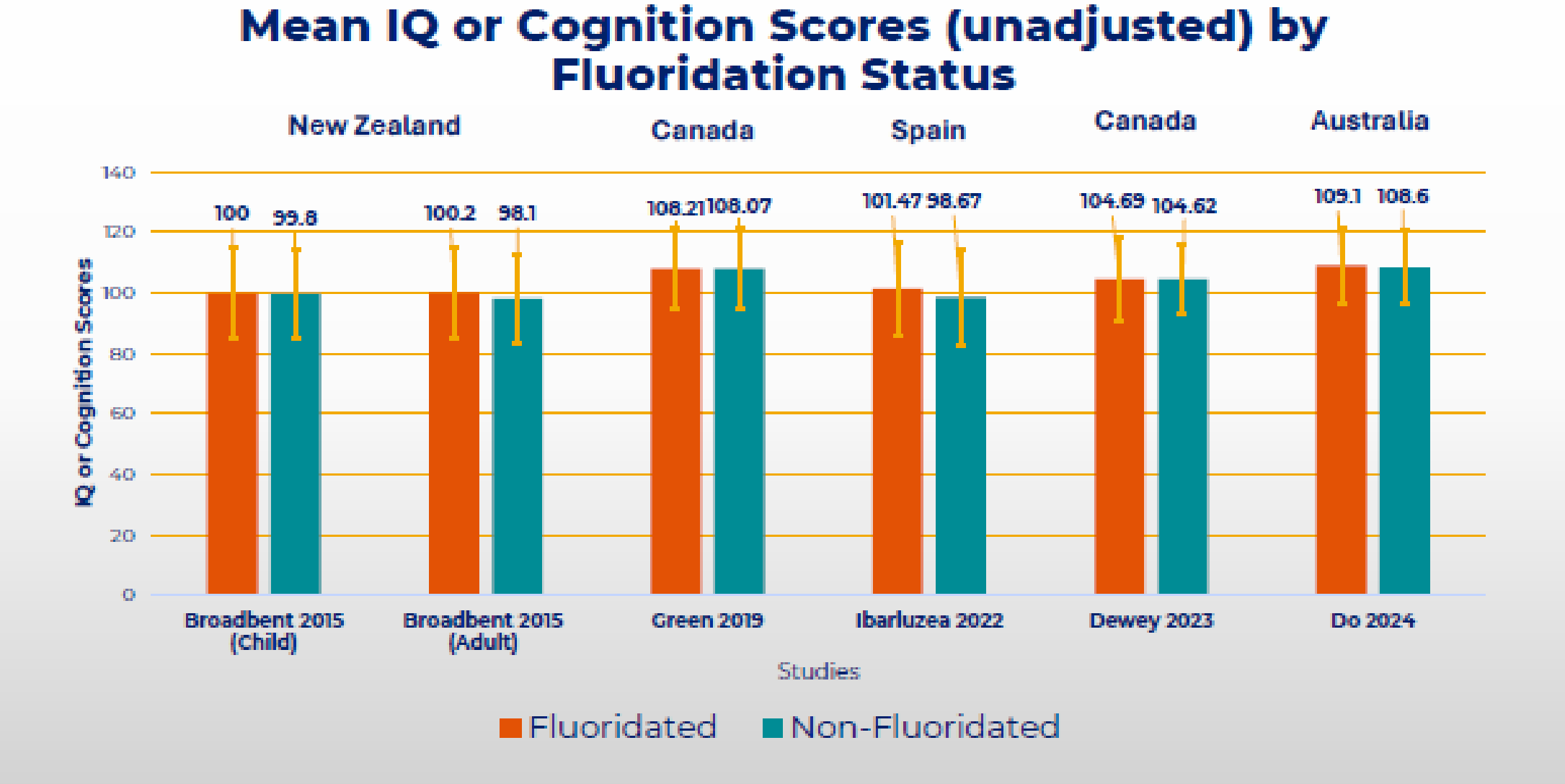
"This Monograph and Addendum do not address whether the sole exposure to fluoride added to drinking water in some countries (i.e., fluoridation, at 0.7 mg/L in the United States and Canada) is associated with a measurable effect on IQ"

"…association between fluoride exposure and children's IQ is **based primarily on studies with estimated fluoride exposures higher than what is generally associated with consumption of optimally fluoridated water in the United States**."



https://ntp.niehs.nih.gov/sites/default/files/2024-08/fluoride_final_508.pdf

Cohort Studies at Community Water Fluoridation Levels

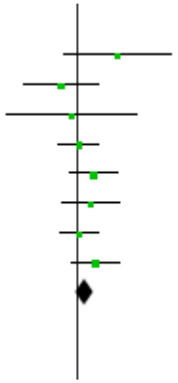


Association between low fluoride exposure and children's intelligence: a meta-analysis relevant to community water fluoridation

1.1.2 Recommnded F (Mean 0.90 mg/L) vs. Lower F (Mean 0.30 mg/L)

Xu 1994	83.83	9.1	32	80.21	8.27	21	2.1%	0.41 [-0.15, 0.96]	1994
Zhang JW 1998	85.6	13.2	51	87.7	11	52	2.8%	-0.17 [-0.56, 0.22]	1998
Xiang 2003	99.56	14.13	9	100.41	13.21	290	1.7%	-0.06 [-0.73, 0.60]	2003
Broadbent (Child) 2015	100	15.1	891	99.8	14.5	99	3.8%	0.01 [-0.19, 0.22]	2015
Sebastian 2015	88.6	14.01	135	86.37	13.58	135	3.6%	0.16 [-0.08, 0.40]	2015
Bashash 2017	96.8	11.16	112	95.37	10.31	77	3.4%	0.13 [-0.16, 0.42]	2017
Green 2019	108.2	13.72	162	108.07	13.31	238	3.8%	0.01 [-0.19, 0.21]	2019
Ibarluzea 2021	101.47	15.5	124	98.67	15.7	123	3.6%	0.18 [-0.07, 0.43]	2021
Subtotal (95% CI)			**1516**			**1035**	**24.8%**	**0.07 [-0.02, 0.17]**	

Heterogeneity: Tau² = 0.00; Chi² = 5.15, df = 7 (P = 0.64); I² = 0%
Test for overall effect: Z = 1.49 (P = 0.14)



A

Study or Subgroup	Regression Coefficient	SE	Weight	IV, Random, 95% CI	Year
Bashash 2017	-0.77	0.9	10.2%	-0.77 [-2.53, 0.99]	2017
Yu 2018	0.36	0.33	76.0%	0.36 [-0.29, 1.01]	2018
Farmus 2021	-0.23	0.775	13.8%	-0.23 [-1.75, 1.29]	2021
Total (95% CI)			**100.0%**	**0.16 [-0.40, 0.73]**	

Heterogeneity: Tau² = 0.00; Chi² = 1.69, df = 2 (P = 0.43); I² = 0%
Test for overall effect: Z = 0.57 (P = 0.57)

Regression Coefficient IV, Random, 95% CI

-4 -2 0 2 4
Favours [Lower Fluoride] Favours [Higher Fluoride]

B

Study or Subgroup	Regression Coefficient	SE	Weight	IV, Random, 95% CI	Year
3.1.1 Community Water Fluoridation					
Green 2019	-0.975	0.825	38.4%	-0.97 [-2.59, 0.64]	2019
Ibarluzea 2021	1.685	1.393	28.9%	1.69 [-1.05, 4.42]	2021
Subtotal (95% CI)			**67.3%**	**0.12 [-2.45, 2.68]**	
Heterogeneity: Tau² = 2.23; Chi² = 2.70, df = 1 (P = 0.10); I² = 63%					
Test for overall effect: Z = 0.09 (P = 0.93)					
3.1.2 Salt Fluoridation					
Bashash2017	-3.15	1.161	32.7%	-3.15 [-5.43, -0.87]	2017
Subtotal (95% CI)			**32.7%**	**-3.15 [-5.43, -0.87]**	
Heterogeneity: Not applicable					
Test for overall effect: Z = 2.71 (P = 0.007)					
Total (95% CI)			**100.0%**	**-0.92 [-3.29, 1.46]**	

Heterogeneity: Tau² = 3.14; Chi² = 7.13, df = 2 (P = 0.03); I² = 72%
Test for overall effect: Z = 0.76 (P = 0.45)
Test for subgroup differences: Chi² = 3.49, df = 1 (P = 0.06), I² = 71.3%

Regression Coefficient IV, Random, 95% CI

-10 -5 0 5 10
Favours [Lower F] Favours [Higher F]

"These meta-analyses show that fluoride exposure relevant to community water fluoridation is not associated with lower IQ scores in children."

Kumar et al. Public Heath 2023;219:73-84. https://doi.org/10.1016/j.puhe.2023.03.011

More on Community Water Fluoridation and IQ from Dr. Susan Fisher Owens…

Fluoride and IQ: Separating Fact from Fiction

Susan Fisher-Owens, MD, MPH, FAAP

Professor of Pediatrics, UCSF SOM
Professor of Preventive and Restorative Dental Sciences, UCSF SOD
Fluoride Consultant, California Office of Oral Health

8/28/25

Nothing to disclose

Except strong desire to help you understand the science!

And, I serve on a Data Monitoring Safety Board for a non-fluoride study being sponsored by Colgate

The Weight of Science

life is better
WITH TEETH

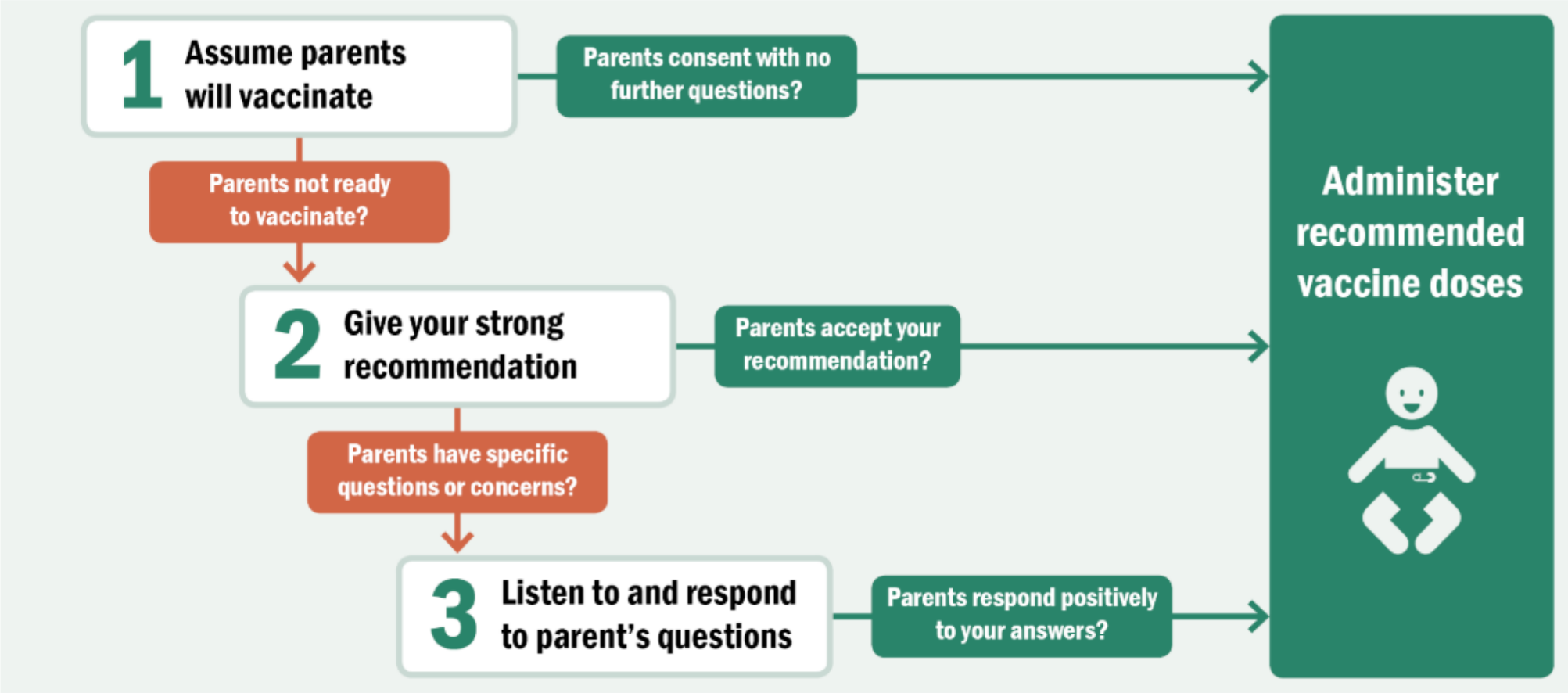
Objectives

- Talking with patients
  - Clear language
  - Lay the groundwork
  - Acknowledge risk
  - Practice conversations

Approach to Difficult Conversations

- Great opportunity to practice MI (motivational interviewing)
- Build trust and empathy
  - Listen actively
- Provide clear and accessible information
- Engage in shared decision-making
- Utilize available resources
- Explore reasons for wanting to use fluoride

Analogous to Vaccines



This flow chart shows three easy steps to take when talking with parents about vaccines.

https://www.cdc.gov/vaccines-children/hcp/conversation-tips/index.html

“CASE” Approach to Vaccine Hesitant Parents

- **C**orroborate
- **A**bout me
- **S**cience
- **E**xplain/advise

https://euronetmrph.org/vaccine-hesitancy-how-to-communicate-with-hesitant-parents-the-c-a-s-e-approach/

NOTHING without Risk

Beyond CWF

- Fluoride varnish
- Supplements
- Healthy DRINKING and eating

"I heard CWF doesn't help anymore?"

- Cochrane review—it DOES still have benefit, just not as much as before
- Calgary

Cochrane Report of CWF (Iheozor-Ejiofor Z 2024)

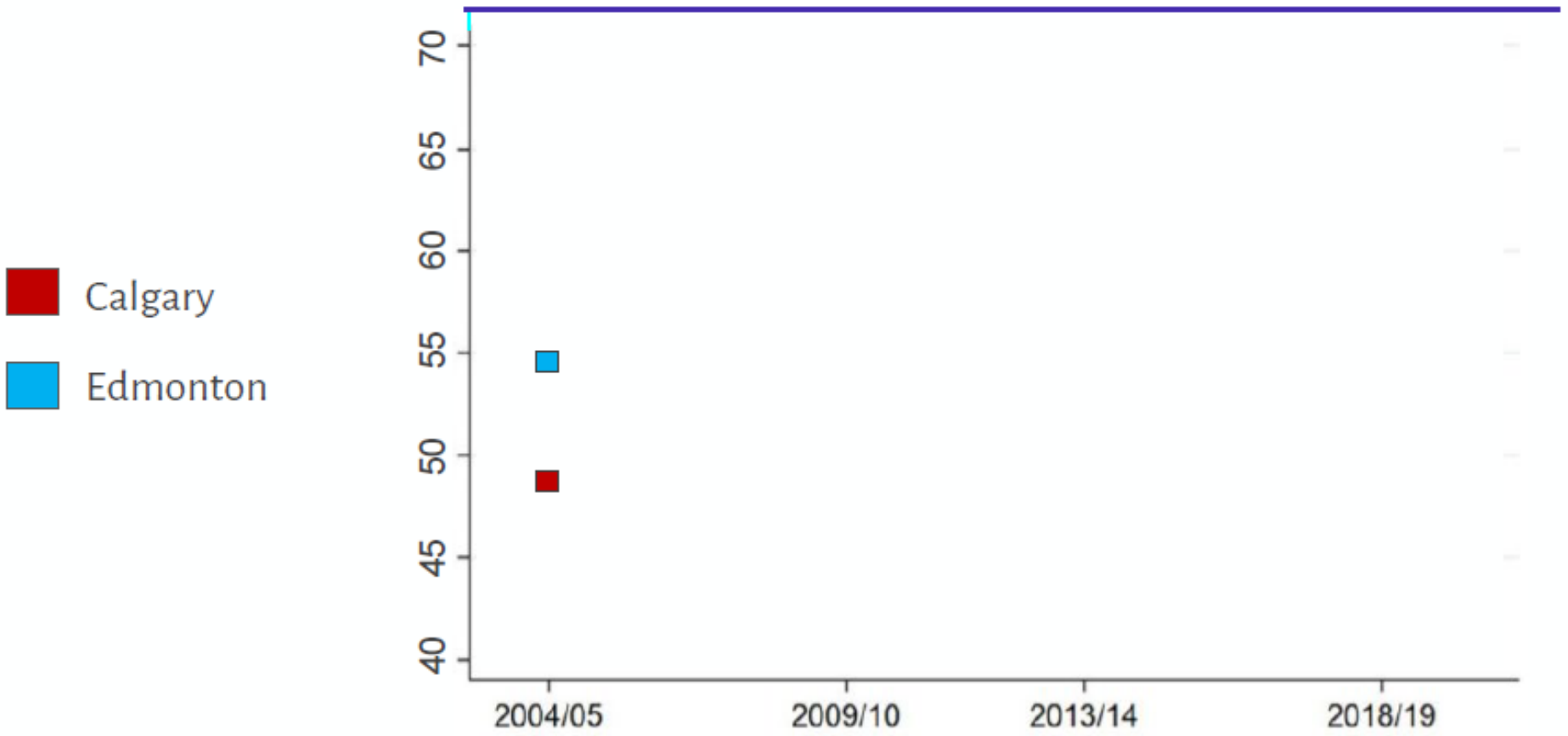
- "beneficial effect not as pronounced—but ***still is a benefit***"
- A co-author of the study, Dr. Anne-Marie Glenny, was quoted as saying, "…**no** evidence to stop fluoridation programs"

Researchers compare trends in two cities

Edmonton's drinking water remained fluoridated throughout the study period

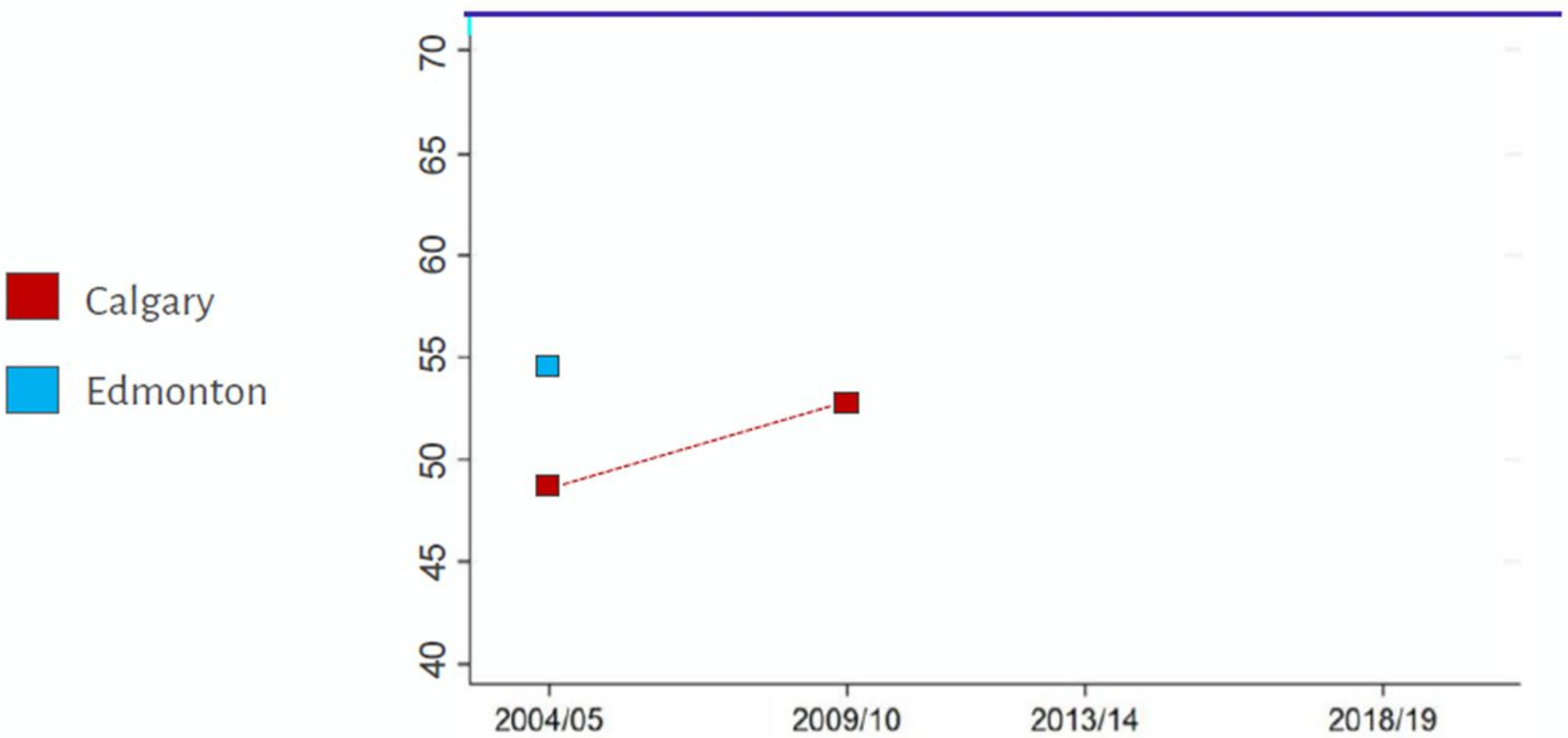
When the research began, **Calgary** fluoridated its drinking water but later decided to end this practice

Initially, Calgary had a lower childhood decay rate



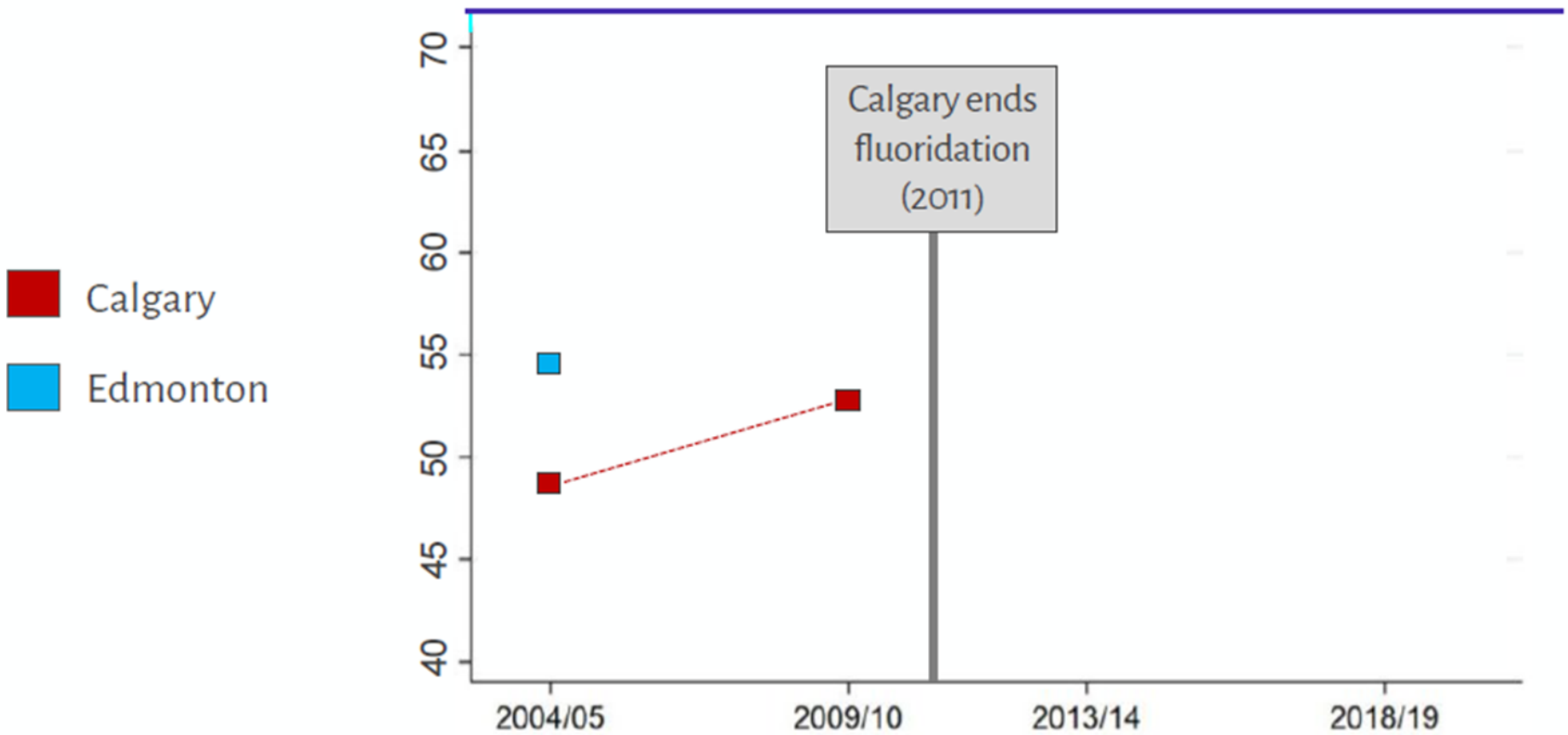
(**Source:** McLaren L, et al., Fluoridation cessation and children's dental caries: A 7-year follow-up evaluation of Grade 2 schoolchildren in Calgary and Edmonton, Canada. Community Dentistry & Oral Epidemiology. 2022;50(5):391-403.)

The decay gap between the cities began to close



(**Source:** McLaren L., et al., Fluoridation cessation and children's dental caries: A 7-year follow-up evaluation of Grade 2 schoolchildren in Calgary and Edmonton, Canada. Community Dentistry & Oral Epidemiology, 2022;50(5):391-403.)

In 2011, Calgary decided to end water fluoridation



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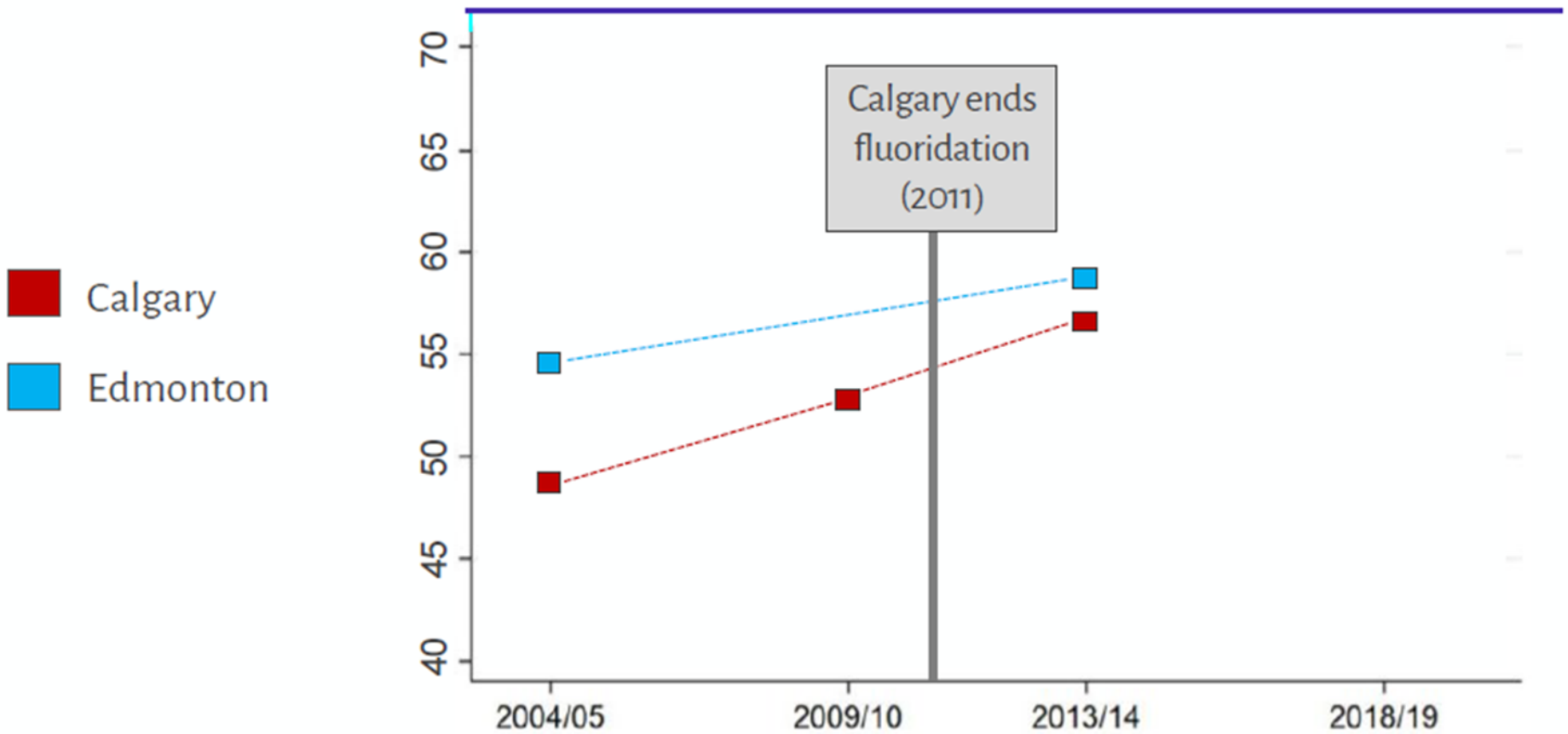
American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Afterward, Calgary's decay rate steadily rose



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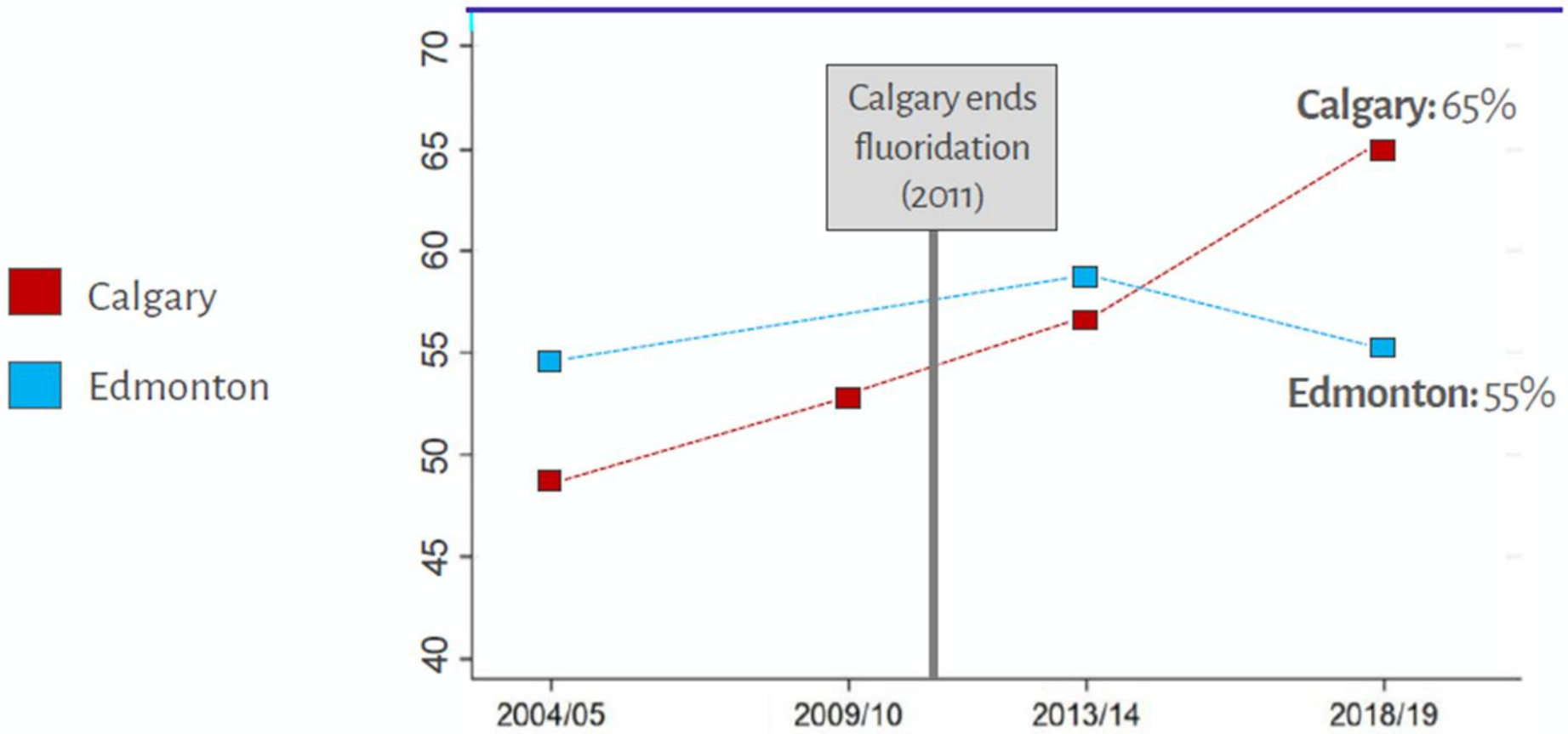
Afterward, Calgary's decay rate steadily rose



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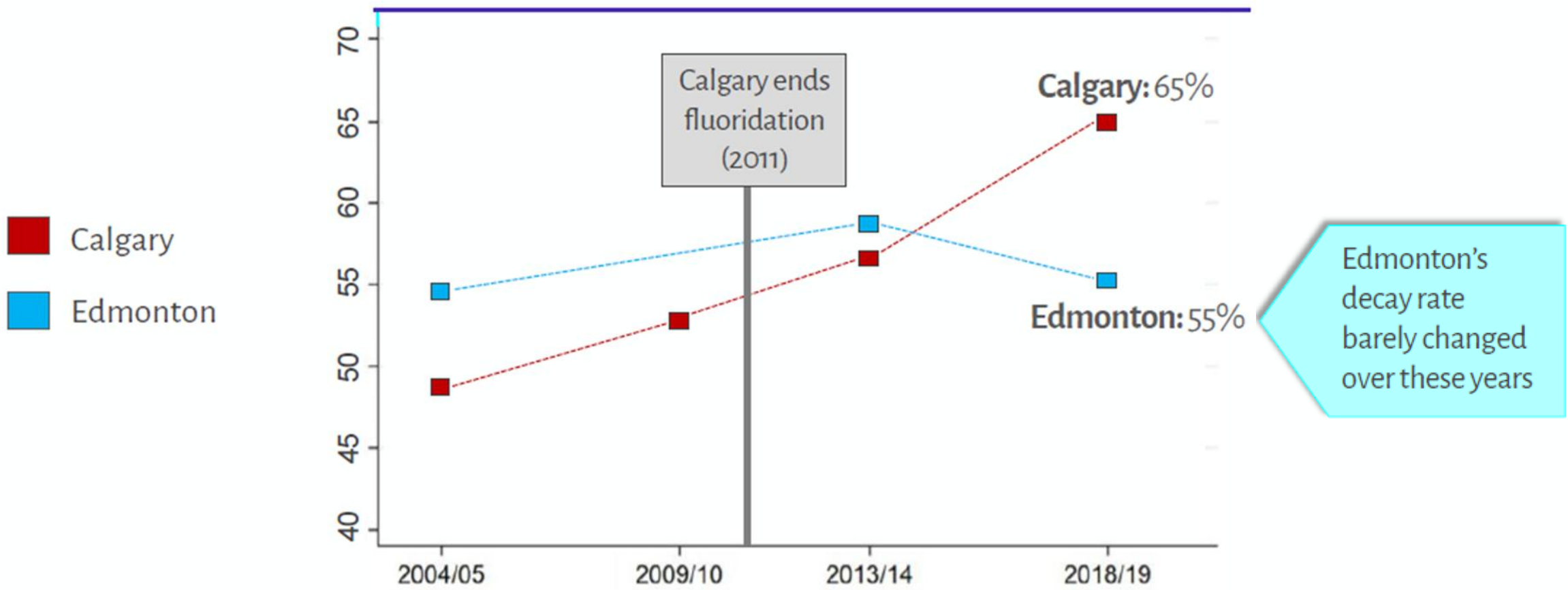

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American Academy of Pediatrics
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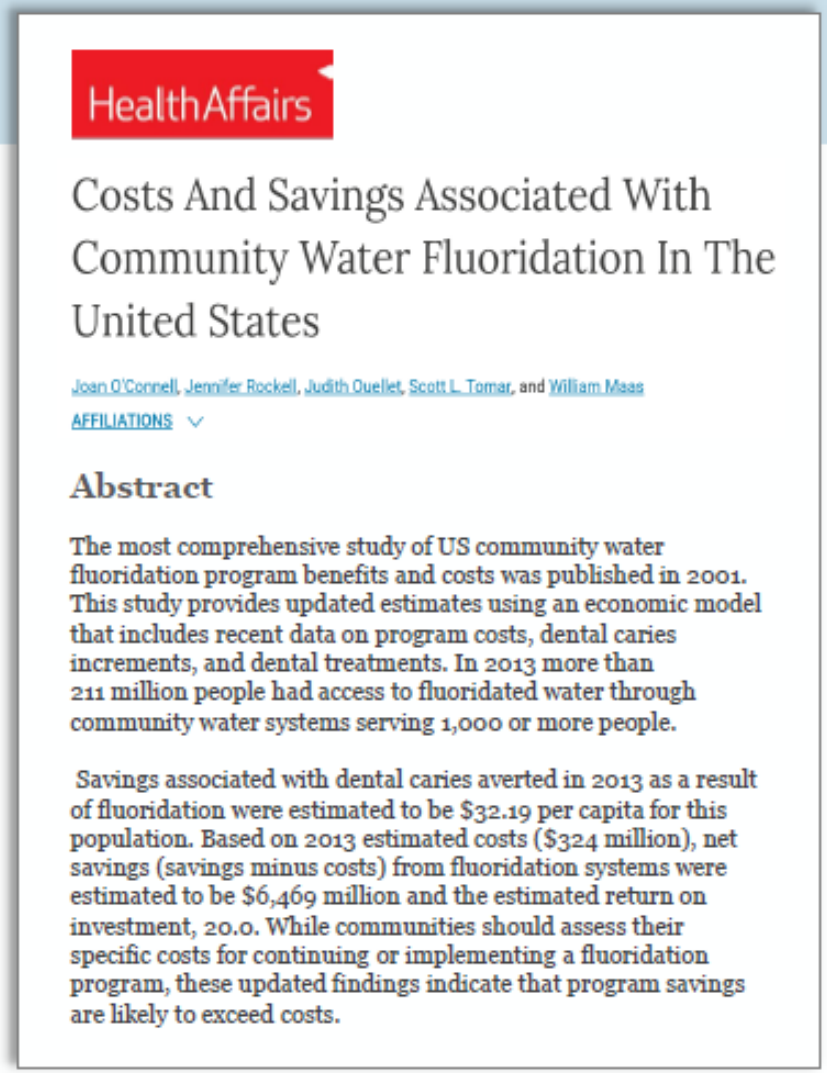
"Is it Industrial Waste?"

- Fluoride is in some waste product, but that is not what is used in CWF
  - Regulated more closely than bottled water
- Tariffs
  - 80% made in US

"Doesn't it Cost Money for Us to Have to Have It?"



HealthAffairs

Costs And Savings Associated With Community Water Fluoridation In The United States

Joan O'Connell, Jennifer Rockell, Judith Ouellet, Scott L. Tomar, and William Maas

AFFILIATIONS

Abstract

The most comprehensive study of US community water fluoridation program benefits and costs was published in 2001. This study provides updated estimates using an economic model that includes recent data on program costs, dental caries increments, and dental treatments. In 2013 more than 211 million people had access to fluoridated water through community water systems serving 1,000 or more people.

Savings associated with dental caries averted in 2013 as a result of fluoridation were estimated to be $32.19 per capita for this population. Based on 2013 estimated costs ($324 million), net savings (savings minus costs) from fluoridation systems were estimated to be $6,469 million and the estimated return on investment, 20.0. While communities should assess their specific costs for continuing or implementing a fluoridation program, these updated findings indicate that program savings are likely to exceed costs.

- A 2016 study showed that every person living in a fluoridated community **saved $32.19 each year**.
- Adjusted for inflation, the savings are now **$43.61 each year**.

(**Sources**: O'Connell, et al., Costs and Savings Associated With Community Water Fluoridation In The United States. Health Affairs, 2016;35(12):2224-2232. doi: 10.1377/hlthaff.2016.0881; we used the online calculator at Measuring Worth to update the $32.19 savings in dental costs to account for changes in purchasing power due to inflation since the year 2013. We used this calculator: https://www.measuringworth.com/calculators/ppowerus/)

"But it is Forced Medication?!"

- Examples of folic acid in flour or vitamin D in milk
- Can use reverse-osmosis filters to remove

"I heard it is Poison?"

- All about the dose: "Right for us at the right dose"

Should I be Fearful of Fluorosis?

Normal

Questionable

Very Mild

Mild

Moderate

Severe

Personal Correspondence, Correction to https://www.fluoridesandhealth.ie/assets/files/documents/fluoridation_forum.pdf/

"What about it Hurting My Bones?"

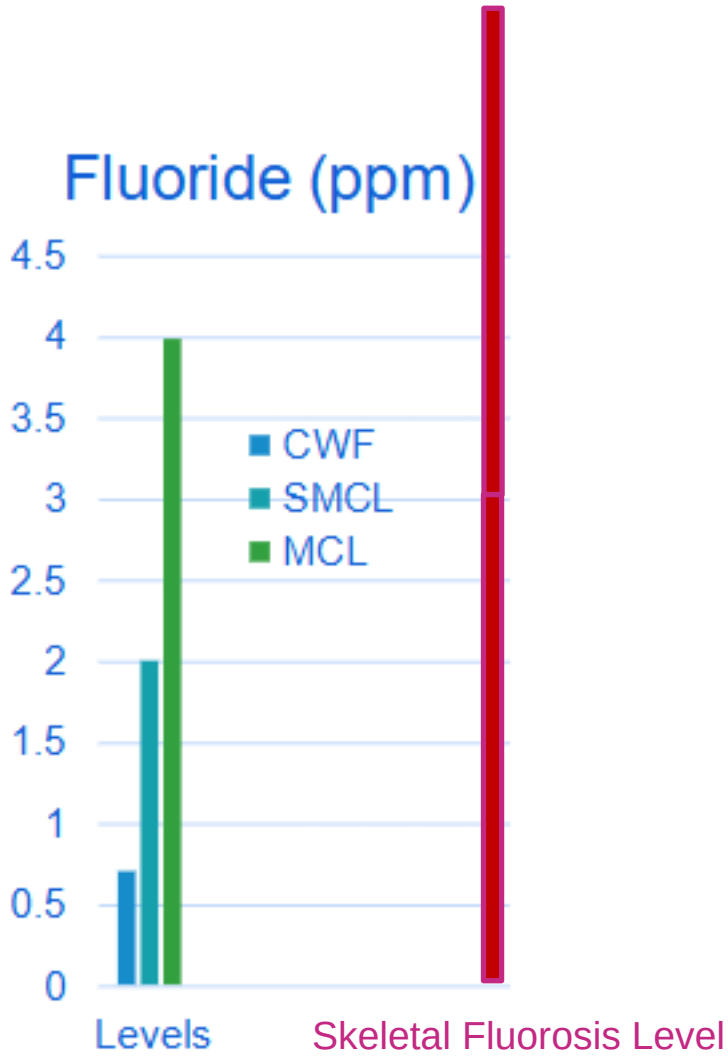
Truth to Skeletal Fluorosis, BUT

- Requires excessive consumption, and years to accumulate

http://www.nejm.org/doi/full/10.1056/NEJMicm1200995

Skeletal Fluorosis

Above 6 ppm



"What about Choice?"

- Hydroxyapatite?
- Can I take it out?
- Do children have a choice to be born poor? With no healthy food options? Into a family who can't afford a toothbrush and toothpaste?
- Take the decision to the end

9-year-old girl dies after going under anesthesia for dental procedure at San Diego office

The March 18 procedure was done at Dreamtime Dentistry. A dentist at the office had been investigated after a patient nearly died in 2016.

#WeArePreventionists!

Thank You!

Susan.Fisher-Owens@ucsf.edu

Ilikemyteeth.org

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