



Watertown City Council
Monday, June 10, 2013
7:00 p.m.

Adjourned City Council Meeting Agenda

- Resolution No. 1 - Appointment to the Development Authority of the North Country,
John B. Johnson, Jr.
- Resolution No. 2 - Approving Amended Lease Agreement, Watertown Rams, Inc.
- Resolution No. 3 - Approving Amended Lease Agreement, Greater Watertown
Red and Black, Inc.
- Ordinance No. 1 - Amending City Municipal Code § A320, Fees

Work Session Agenda

Discussion Items:

1. Review of Destination Marketing
Thousand Islands International Tourism Council
Gary DeYoung, Director of Tourism
2. Snow Dump Improvement Discussion
Kurt W. Hauk, City Engineer
3. Community Fluoride Program
Jayanth V. Kumar, DDS, MPH
Bureau of Dental Health, NYS Department of Health

Res No. 1

June 5, 2013

To: The Honorable Mayor and City Council

From: Sharon Addison, City Manager

Subject: Appointment to the Development Authority of the North Country,
John B. Johnson, Jr.

The attached resolution was prepared for City Council consideration at the request of Mayor Jeffrey E. Graham. If adopted, the resolution provides for the appointment of John B. Johnson Jr. to the Development Authority of the North Country. This appointment is effective June 10, 2013, for a term of four years.

RESOLUTION

Page 1 of 1

Appointment to the Development Authority
of the North Country, John B. Johnson, Jr.

Council Member BURNS, Roxanne M.
Council Member BUTLER, Joseph M. Jr.
Council Member MACALUSO, Teresa R.
Council Member SMITH, Jeffrey M.
Mayor GRAHAM, Jeffrey E.
Total

YEA	NAY

Introduced by

RESOLVED that the following individual is appointed to the Development Authority of the North Country for a four-year term, such term expiring on June 10, 2017:

John B. Johnson, Jr.
1412 Loomus Drive
Watertown, New York 13601

Seconded by

June 6, 2013

To: The Honorable Mayor and City Council
From: Elliott B. Nelson, Confidential Assistant to the City Manager
Subject: Amended Lease Agreement; Watertown Rams

Attached for City Council consideration and approval is an amended Lease Agreement between the City and the Watertown Rams professional baseball organization. As Council is aware, the Rams have approached City staff regarding the amendment of their Lease Agreement to allow a third party to manage food and alcohol concessions. This amended Agreement will allow the Rams to partner with Savory Beverages and Beyond, LLC, to provide this service at Rams games. Much like the City's prior agreement with the 1000 Island Privateers professional hockey organization, this Agreement holds the third party alcohol vendor responsible for compliance with the State Liquor Authority and protects the City from the liabilities arising from the sale of alcohol.

Staff will be available to answer any questions Council may have regarding this amended Lease Agreement.

RESOLUTION

Page 1 of 1

Approving Amended Lease Agreement,
Watertown Rams, Inc.

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

YEA	NAY

Total

Introduced by

WHEREAS the City Council of the City of Watertown approved a Lease Agreement between the City of Watertown and the Watertown Rams at the Regular Meeting of the City Council on January 22, 2013, and

WHEREAS the Watertown Rams have approached the City regarding entering into a sub-franchise agreement with a third party for the purpose of providing food and alcohol concessions, and

WHEREAS an amended Lease Agreement between the City of Watertown and the Watertown Rams has been prepared for City Council Consideration;

NOW THEREFORE BE IT FURTHER RESOLVED that City Manager Sharon Addison is hereby authorized and directed to execute the amended Lease Agreement on behalf of the City of Watertown, a copy of which is attached and made a part of this resolution.

Seconded by

LEASE AGREEMENT

**THE CITY OF WATERTOWN, NEW YORK AND
WATERTOWN RAMS, INC.**

This Lease is being made and is intended to be effective as of May 15, 2013, between the City of Watertown, New York, with its principal offices located at 245 Washington Street, Watertown, New York 13601 (“City”) and Watertown Rams, Inc., with its principal offices located at 1030 Bronson Street, Watertown, New York, (“Baseball”).

INTRODUCTION

WHEREAS, the City is a municipal corporation organized under the laws of the State of New York and, as such, owns a facility known as the Alex T. Duffy Fairgrounds (the “Fairgrounds”) within the City of Watertown, and the Fairgrounds are a community recreational facility; and

WHEREAS, the City desires to promote future recreational activities at the Fairgrounds for the valid public purpose of the benefit, recreation, entertainment, amusement, convenience and welfare of the people of the City; and

WHEREAS, in pursuit of that public purpose, the City desires to contract for the use, operation, management and maintenance of the Fairgrounds baseball facilities and all baseball-related activities; and

WHEREAS, Baseball owns and operates a summer collegiate baseball team as a member and franchise of the Perfect Game Collegiate Baseball League (“PG Collegiate League”); and

WHEREAS, Baseball desires to have its team, the Watertown Rams (the “Team”), play baseball games within the confines of the Fairgrounds baseball field and is in a unique position to contract to use, operate, manage and maintain the Fairgrounds baseball facilities; and

WHEREAS, the City has undertaken a substantial capital improvement project for the Fairgrounds in furtherance of the public purpose of keeping baseball in the City for the recreation, entertainment and welfare of the people of the City, including the economic benefit such a team can bring.

NOW, THEREFORE, in consideration of mutual covenants and agreements as stated herein, the City and Baseball agree as follows:

AGREEMENT

Section I – Term of Lease

The term of this Lease Agreement shall be for the period, from May 15, 2013 through August 15, 2013.

Section II – Premises Leased

The City agrees to lease to Baseball the premises generally known as the Alex T. Duffy Fairgrounds baseball field and all incidents thereto, including the grandstands, concession facilities and certain locker rooms as highlighted in yellow on the attached map, all of which consisting of essentially that area bounded by the baseball field fence separating the baseball field from the remainder of the Fairgrounds, together with the immediately adjacent parking area (the “Premises”).

Section III – Non-Assignability and Non-Exclusivity

a. The City and Baseball agree that it is the purpose of this Agreement to contract for the use, operation, management and maintenance of the Premises, and that this is an agreement for the privilege of Baseball to use the Premises only for the purpose of collegiate baseball. This Lease Agreement may not be assigned by Baseball to any person or entity, and Baseball agrees that the City’s consent to any assignment may be withheld for any reason, and in its sole discretion.

b. The City agrees not to enter into a lease for the Premises with any other minor league, professional or collegiate league during the term of this lease, without the written consent of Baseball.

c. It is further understood that this Lease Agreement is non-exclusive, meaning that, at those times when the Premises are not being used for Baseball’s purposes, the City retains the right to make the Premises available for other uses to the extent that the use will not interfere with those purposes. By express understanding it will not be interference for the City to allow the playing field to be used by college, high school, little league or other local baseball teams, or to permit others to host outdoor concerts on the Premises. At such times, it shall be the City’s responsibility to maintain the Premises in good repair. Baseball agrees it will cooperate with the City in making the premise available to others. The City will notify Baseball when an event is scheduled at the Premises.

Section IV – Compensation (Rent)

a. As compensation for the use of the Premises, and during the term of this Lease, Baseball shall pay to the City fees as follow:

Day Game	\$125.00 per game
Night Game	\$150.00 per game
Double-Header	\$250.00 per occurrence
Day Practice	\$ 75.00 per practice (up to 3 hours)
Night Practice	\$100.00 per practice
Day Camp	\$ 75.00 per day

Day game means any game that ends before 6:00 p.m.

Night game means any game that begins at or extends beyond 6:00 p.m.

Doubleheaders shall be billed as two games.

Day practice means any practice that ends before 6:00 p.m.

Night practice means any practice that starts after 6:00 p.m.

b. Baseball will provide the City Department of Parks and Recreation and the City Comptroller’s Office with a schedule detailing all planned field use for games, practices and camps no later than April 1st.

c. Payment must be made to the City Comptroller by the first day of the month for that month’s scheduled events at the Premises. If full payment is not made by the Rams by the first day of the month for that month’s scheduled events, or any other unpaid invoice is over 30 days outstanding, the Rams will not be authorized to use the Premises until full payment is made. An invoice will be generated at month’s end for any additional time used above and beyond scheduled time by the Rams and must be paid within 30 days. The Rams shall not receive credit for any unused, but scheduled, filed time, unless in the event of inclement weather.

Section V – Non-Alcohol Concessions and Advertising

a. It is the purpose of this Section to provide an incentive to Baseball to operate concessions during the term of the lease for all Fairgrounds activities, for the benefit of both Baseball and the City. The City and Baseball agree that during the term of this lease, concession rights for the sale of food and non-alcoholic drinks, as well for baseball souvenir items sold on the Premises shall be exclusive to Baseball. The City shall not permit nor allow mobile units or other vendors or concessions upon the Premises during events or activities being conducted by Baseball or others during the term of this lease. Prior to opening the concessions for sale of food and drink, Baseball will provide the City

with all applicable licenses, including but not limited, required NYS Department of Health.

b. All expenses incurred in providing concessions shall be at the sole expense of Baseball.

c. The City authorizes Baseball to install soda vending machines on the Premises. The City, in its sole discretion, can ask to have the vending machines removed if vandalism occurs.

d. Baseball shall be responsible for causing the concessions to be open and operated for all Watertown Rams events. Additionally, Baseball shall be responsible for causing the concessions to be open and operated during the hours of Fair Week if an event is held in the grandstand area. In the event that non-Rams events are held at the Leased Premises during Baseball's regular season, Baseball shall be responsible for causing the concession to be opened and operated for those events.

e. Baseball will be allowed to sell Advertising to be placed within the leased Premises. The Parks and Recreation Crew Chief must approve all advertising prior to installation. It will be the responsibility of Baseball to install and remove the Advertising, including the removal of all hardware. In the event that all signage and/or hardware is not removed by August 31st, Baseball will be responsible for reimbursing the City for the costs of removing said signage and/or hardware. A fee of \$3,000.00 shall be paid to the City Comptroller's Office no later than May 15, 2013. Signs can be up only between May 15th and August 31st.

Section VI – Sale of Alcoholic Beverages

a. The Rams desire to provide for the sale of beer at the games to be held pursuant to this Agreement, and to enter into a sub-franchise agreement with a person or entity who or which shall obtain a seasonal license for beer sales for the Watertown Municipal Fairgrounds Main Baseball Field limited to the term of this Agreement from May 15, 2013 through August 15, 2013.

The Rams' sub-franchise agreement shall provide that, together with the Rams, the sub-franchisee shall be bound by the terms of the City's "ABC Law, Rules and Guidelines," as the same may, from time to time, be amended. A copy of the City's current "ABC Law, Rules and Guidelines" is attached to this Agreement as Exhibit "D." The sub-franchisee shall also be specifically bound by the terms and conditions of any seasonal license issued by the State Liquor Authority.

The Rams' sub-franchisee shall provide the City with a copy of any application for the seasonal license, and shall, at a minimum as part of the application, show the locations of all points of sale; indicate the manner in which control of the sale of alcoholic beverages will be maintained; contain an acknowledgement that it will

discontinue the service of alcohol at any time when directed to do so by the shift supervisor of the Watertown City Police; provide proof of the sub-franchisee's liquor liability insurance coverage in the amount of \$1,000,000.00 individual/\$2,000,000.00 aggregate; and represent that the times of alcohol service must be no earlier than one-half hour prior to the commencement of any game and that all service will be discontinued at the start of the third period of any game.

The Rams acknowledge that, as the party responsible for the sub-franchisee, it is obligated not to permit the sale of alcoholic beverages in violation of the New York Alcoholic Beverage and Control Law, the New York Penal Law, and/or the New York General Obligations Law. If it is determined that the Rams' sub-franchisee has sold beverages in violation of any of the applicable rules and regulations, including any term of this franchise, the Rams' right to contract with a sub-franchisee for the sale of alcohol on the premises will be immediately revoked.

The Rams acknowledge that the City of Watertown is not involved in the sale of alcoholic beverages, and agrees to defend and indemnify the City, including reimbursement of the City's reasonable attorneys' fees, from any and all claims, civil or criminal, arising from any claimed violations of law pertaining to, or statutory duty arising from, the sale of alcoholic beverages.

(1) Baseball Games: At no time shall alcohol sales begin more than one hour prior to the start of the game, and all alcohol sales will cease at the end of the 7th inning stretch. If a double header is being played, sales shall end following the completion of the 5th inning of the second game.

(2) Other events: The sale of alcohol shall not be allowed more than one hour prior to the commencement of the event and shall stop at least one half hour prior to the scheduled conclusion of the event. "Other events" are limited to events taking place during the week of the Jefferson County Fair, or as approved by the City Manager.

Section VII – Adequacy of Leased Premises

a. Baseball represents that the Premises satisfy the requirements of the Perfect Game Collegiate Baseball League and that the City shall not be obligated to make any changes to the Premises and the office space during the term of this Lease to satisfy any requirements of Baseball or the Perfect Game Collegiate Baseball League.

b. Baseball shall certify in writing to the City that it has accepted, in good order and repair, the Premises. This certification by Baseball shall include a statement that Baseball has examined and knows the condition of the Premises and has received the same in good repair and working order. Any exceptions by Baseball to the condition of the Premises at the time of their receipt shall be provided to the City in writing.

Section VIII – Maintenance

a. The City agrees that it will keep the Premises, including any structural or capital repairs and improvements, in good repair during the term of this Lease, and at its own expense. The City further agrees that it shall bear the cost of electric facilities and electric service to the Premises.

b. Baseball agrees to provide custodial maintenance of the Premises during the term of the Lease. Baseball is responsible for cleaning the Leased Premises after every game or practice. Baseball shall keep the Premises secure and keep unauthorized persons off of the roof in the grandstand area. Baseball agrees to be further responsible for maintenance of the Premises for all non-baseball activities that Baseball permits to take place on the Premises while the facilities are in the possession of Baseball. If Baseball has the concessions open for a non-Baseball event, they will still be responsible for custodial maintenance and cleanup of the Premises. Baseball must complete all custodial and maintenance clean-up within one hour of game or event completion. A minimum charge of \$25.00 per hour will be invoiced will be invoiced to the Rams for failure to complete clean-up within one hour of game or event completion and will be due within 30 days of receipt.

c. The City agrees that it will maintain the baseball field. Baseball acknowledges, however, that the City's employees are not responsible for the laying and removal of the main field tarp prior to, during, or after any particular baseball game. The City agrees to provide up to four bags of Turface drying agent per game. Any Turface used above and beyond four bags will be charged back to the Rams at the City's cost.

d. If all or any part of the Premises are damaged or destroyed by Baseball, or by any of its agents or employees, or by any of Baseball's patrons, or during any event for which Baseball is responsible, (for example, damage or destruction to the outfield fence), Baseball agrees that it will immediately cause repairs or, if the City repairs the damage, that it will reimburse the City for such damage or destruction.

Section IX – Parking Fees

Baseball acknowledges that the City reserves the right to assess a parking charge, per car, at each home game for the Team. This amount may increase at the City's sole discretion. The parties agree that the City shall be responsible for collecting the fee, and that all proceeds from parking shall inure to the City.

Section X – Office Space

As part of the Fairgrounds Capital Improvement Project, the City constructed office space. A portion of that office space has been requested for use by Baseball from May 15th through August 15th. The City agrees to lease a portion of the office space to

Baseball for Six Hundred Dollars (\$600.00) for the term, which amount shall be paid in the same manner as detailed in Section IV c, above. In the event Baseball no longer desires to occupy the office space, Baseball may vacate the office upon thirty (30) days' written notice to the City, and the lease payment due will be prorated. This office space shall be considered part of the Premises for purposes of Section XV.

The Rams shall be permitted to rent 100 chairs, from the period of May15, 2013 thru August 15, 2013 for the amount of \$1,500.00, to be paid to the City Comptroller's Office by May 15, 2013. The Rams will be responsible for compensating the City for any lost or damaged chairs.

Section XI – Concession Space

a. As part of the Fairgrounds Capital Improvement Project, the City constructed concession space. Baseball has requested exclusive use of the concession space during the term of this Lease. The City agrees to lease concession space highlighted in yellow on the attached map, to Baseball for twenty eight hundred dollars (\$2,800) for the term, which amount shall be paid in the same manner as detailed in Section IV c, above.

b. In the event that a non-Rams event requiring paid admission is held within the Leased Premises during the term of the lease that has attendance which exceeds 1,000 people, Baseball will pay the City an additional \$500 for lease of the concession space for that event. If the attendance at such an event exceeds 2,000 people, Baseball will pay the City an additional \$1,000 for lease of the concession space for that event.

Section XII – Insurance

a. Baseball agrees to name the City as an additional named insured for its liability coverage, and to provide proof of general liability insurance in the amount of \$500,000 per person and \$1,000,000 per occurrence, and property damage coverage in the amount of \$100,000. Baseball shall provide the City with copies of its declarations pages for the policy or policies during the duration of the Lease Agreement. Baseball's policies of insurance may not limit the City's coverage as an additional insured to vicarious liability issues only.

b. The City will insure the Premises to cover only the City's interest in the event of damage due to fire or other hazard. Baseball agrees that, if the Premises are materially damaged by fire or other casualty, the City is not obligated to restore the Premises, and Baseball will have no claim under this lease against the City for not restoring the Premises.

c. Baseball shall procure and maintain workers' compensation insurance and disability insurance in accordance with the laws of the State of New York. This insurance shall cover all persons who are employees of Baseball under the laws of the

State of New York. Proof of said insurance shall be provided to the City of Watertown upon signing of this Agreement.

Section XIII – Hold Harmless

Baseball shall indemnify and hold the City harmless, including reimbursement for reasonable attorneys' fees, from any and all loss, costs or expense arising out of any liability or claim of liability for injury or damages to persons or to property sustained by any person or entity by reason of Baseball's operation, use, or occupation of the Premises, or by or resulting from any act or omission of Baseball or any of its officers, agents, employees, guests, patrons or invitees. The liability insurance in the type and amounts identified at Section XII, naming the City as an additional named insured, shall be sufficient for purposes of meeting Baseball's obligations under this paragraph.

Section XIV – Venue and Applicable Law

a. The City and Baseball agree that the venue of any legal action arising from a claimed breach of this Lease is in the Supreme Court, State of New York, in and for the County of Jefferson.

b. This Agreement shall be construed in accordance with the laws of the State of New York.

Section XV – Right of Access

The City reserves the right to enter the Premises by its duly authorized representatives at any reasonable time which does not interfere or conflict with the conduct of the business of Baseball, for the purposes of inspecting the Premises, performing any work necessary to required on the part of the City, exhibiting the Premises, or in the performance of its police powers.

Section XVI – Return of Premises

Baseball agrees to return the Premises to the City, upon the expiration of this Lease, in as good condition as when Baseball received possession of the Premises, reasonable wear and tear excepted, and excepting damage to the Premises caused by others when the Premises were not under the control of Baseball. The City and Baseball will conduct an initial walk through of the Premises at the beginning of the lease term. Upon expiration of the lease, The City and Baseball will conduct a final walk through of the Premises

Section XVII – Desire to Renew Notice

If Baseball desires to have a lease Agreement for the following year, they must notify the City in writing by January 31st.

Section XVIII – Notice

All notices required to be given under this Lease shall be in writing and shall be deemed to have been duly given on the date mailed if sent by certified mail, return receipt requested, to:

To City: Sharon Addison, City Manager
City of Watertown
245 Washington Street
Watertown, New York 13601

To Baseball: Todd Kirkey, General Manager
Watertown Rams, Inc.
1030 Bronson Street
Watertown, New York 13601

A party may change the address to which notices are to be sent by written notice actually received by the other party.

IN WITNESS WHEREOF, the City and Baseball will have caused this Lease to be executed by authorized agents to be effective as of May 15, 2013.

THE CITY OF WATERTOWN, NEW YORK

By: _____
Sharon Addison, City Manager

WATERTOWN RAMS INC.

By: _____
Todd Kirkey, General Manager

STATE OF NEW YORK)
COUNTY OF JEFFERSON) ss.:

On _____, 2013, before me, the undersigned, a Notary Public, in and for said State, personally appeared Sharon Addison, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me he executed the same in his capacity and that by his signature on the instrument, the individual or the person upon whose behalf the individual acted, executed the instrument.

NOTARY PUBLIC

STATE OF NEW YORK)
COUNTY OF JEFFERSON) ss.:

On _____, 2013, before me, the undersigned, a Notary Public, in and for said State, personally appeared Todd Kirkey, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me he executed the same in his capacity and that by his signature on the instrument, the individual or the person upon whose behalf the individual acted, executed the instrument.

NOTARY PUBLIC

June 6, 2013

To: The Honorable Mayor and City Council

From: Elliott B. Nelson, Confidential Assistant to the City Manager

Subject: Greater Watertown Red and Black Lease Amendment

At its Regular Meeting on January 22, 2013, the City Council approved a Lease Agreement with the Greater Watertown Red and Black football team. Since that time, the City has received a request from George Ashcraft, President Red and Black organization, stating his intention to partner with Johnny D's to provide food and non-alcoholic drink concessions at all home game events. At the recommendation of Parks and Recreation Superintendent Gardner, this attached amendment will increase the flat fee paid to the City for the right to sell concessions. This fee is similar to that assessed upon the Watertown Rams baseball team, who also entered into a similar arrangement with Savory Beverages and Beyond, LLC. All other terms and conditions of the original Lease Agreement remain unchanged.

City staff will be available at the meeting to answer any questions Council may have on this legislation.

RESOLUTION

Page 1 of 1

Approving Amended Lease Agreement,
Greater Watertown Red and Black, Inc.

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

YEA	NAY

Total

Introduced by

WHEREAS the City Council of the City of Watertown approved a Lease Agreement between the City of Watertown and the Greater Watertown Red and Black, Inc at the Regular Meeting of the City Council on January 22, 2013, and

WHEREAS the Greater Watertown Red and Black have approached the City regarding entering into a sub-franchise agreement with a third party for the purpose of providing food and non-alcoholic drink concessions, and

WHEREAS an Amendment to the Lease Agreement between the City of Watertown and the Watertown Rams has been prepared for City Council Consideration;

NOW THEREFORE BE IT RESOLVED that City Manager Sharon Addison is hereby authorized and directed to execute an Amendment to the Lease Agreement between the City of Watertown and the Greater Watertown Red and Black on behalf of the City of Watertown, a copy of which is attached and made a part of this resolution.

Seconded by

FIRST AMENDMENT TO LEASE AGREEMENT

THE CITY OF WATERTOWN, NEW YORK AND GREATER WATERTOWN RED AND BLACK, LLC

This First Amendment to Lease Agreement is being made and is intended to be effective as of June 11, 2013 between the City of Watertown, New York, with principal offices located at 245 Washington Street, Watertown, New York 13601 (“City”) and Greater Watertown Red and Black, Inc., with its principal offices located at 1358 Washington Street, Watertown, New York, (“Football”).

INTRODUCTION

WHEREAS, the City and Football entered into a Lease Agreement for the Footballs’ use of the Alex T. Duffy Fairgrounds football field for the 2013-2015 football season, which Agreement was effective April 1, 2013; and

WHEREAS, the parties now desire to amend that Agreement by Amendment effective as of June 11, 2013, to reflect the parties’ intentions concerning the Footballs’ grant of a sub-franchise for the sale of food and non-alcoholic drink concessions during Football’s games;

1. The parties hereby agree to amend the Lease Agreement as follows:

Section V – Concessions and Advertising

- c. Football shall pay the City \$700.00 for rights to sell concessions on the Leased Premises for the term of this lease. Full payment must be made to the City Comptroller by April 1 of each year.

All other terms and conditions of the Agreement between the parties last approved by City Council January 22, 2013 remain in full force and effect.

Dated: _____

THE CITY OF WATERTOWN, NEW YORK

By: _____
Sharon Addison, City Manager

Dated: _____

GREATER WATERTOWN RED AND BLACK,
INC.

By: _____
George Ashcraft, President

June 6, 2013

To: The Honorable Mayor and City Council

From: Elliott B. Nelson, Confidential Assistant to the City Manager

Subject: Parks and Recreation Fees

At its May 20, 2013 Regular Meeting, City Council agreed in principal to support a new set of Parks and Recreation fees proposed by Superintendent Gardner. Attached for Council's review and approval is an ordinance codifying the fees agreed to at that time.

At the request of Superintendent Gardner, the attached ordinance condenses all Parks and Recreation fees into a single section of the City Code. As such, the attached ordinance contains references to fees that have not changed. This new code structure will allow citizens as well as staff to easily peruse the schedule of fees.

This ordinance also codifies new language concerning parking fees for concerts and performances and the Fairgrounds and Municipal Arena. The new language reads as follows: "A \$1,500 (or \$3,000, where applicable) fee will be charged to the concert/performance/show promoter when parking requires City staff assistance." This new language will clarify the vagueness contained within the previous parking fee provisions of the City Code.

City staff will be available at the meeting to address any questions Council may have regarding this legislation.

ORDINANCE

Page 1 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

YEA	NAY

Introduced by

Total

BE IT ORDAINED that Article III of Chapter A320 of the City Code of the City of Watertown is amended by naming it Parks and Recreation Fees

and,

BE IT FURTHER ORDAINED that Section A320-4 of the City Code of the City of Watertown is amended to read as follows:

§ A320-4. Schedule of Fees.

A. The schedule for fees and rates at the City’s Municipal Arena shall be established and enforced as follows. Reserving the use of the Municipal Arena by any group may be obtained by scheduling in advance with the City’s Parks and Recreation Department and in payment of the appropriate fee as described below to the City Comptroller in advance of the reserve time use unless otherwise stipulated in an agreement between the user and the City. Nothing in this section shall prohibit the City from entering into an agreement for the use of the Municipal Arena, at rates other than the rates described below. However, any such agreement shall require the approval of the City Council.

(1) Public skating:

- I. \$2 per person, per session.
- II. Admission for public skating shall be payable upon entry to the facility. There shall be no charge for spectators at public skating sessions.

(2) Season skating pass:

- I. City residents: \$25 per pass.
- II. Non-City residents: \$40 per pass.

ORDINANCE

Page 2 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (3) Ice skate rental: \$2 per pair.
- (4) Ice skate sharpening: \$5 per pair.
- (5) Minor hockey and figure skating: \$70 per hour.
- (6) High school and college practice: \$70 per hour.
- (7) Adult and out-of-town groups: \$80 per hour.
- (8) Rock and Skate: \$3 per person, per session.
- (9) Slip, Slide and Skate: \$2.50 per person, per session.
- (10) Broomball: \$4 per person, per session.
- (11) Events where admission or donation is charged: \$100 per hour.
- (12) Shows and events: \$500 per day; \$250 per day to reserve the Arena prior or post event; plus additional expenses agreed upon and included in the contract.
- (13) Performances: \$1,000 per day; \$500 per day to reserve the Arena prior or post event; plus additional expenses agreed upon and included in the contract.
- (14) Use of the Arena by the Jefferson Country Agriculture Society during Jefferson County Fair week: \$3,000.

ORDINANCE

Page 3 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (15) Non-prime-time ice rates and usage credit:
 - I. Non-prime-time hours are 6:00 a.m. to 7:30 a.m., and 10:30 p.m. to 12:00 midnight.
 - II. Non-prime-time rate: \$42 per hour. Once non-prime-time has been scheduled, it is non-cancelable, and the scheduler will be charged.
 - III. Usage credits are calculated as follows: for every four (4) hours of non-prime-time usage during a season, the user earns one (1) hour credit of non-prime-time usage. Usage credits must be used within the season earned.

- (16) Food concessions: Event promoters shall be charged a flat rate of \$250 for the right to allow concessions at their event. An additional \$750 shall be charged if the event promoter desires the City’s concession stand to be closed throughout the duration of said event.

- (17) Parking: A \$1,500 fee will be charged to the concert/performance/show promoter when parking requires City staff assistance.

- B. Municipal Fairgrounds facility fees shall be established and enforced as follows. Reserving the use of the Municipal Fairgrounds facilities by any group may be obtained by scheduling in advance with the City’s Parks and Recreation Department and in payment of the appropriate fee as described below to the City Comptroller in advance of the reserve time use unless otherwise stipulated in an agreement between the user and the City. Nothing in this section shall prohibit the City from entering into an agreement for the use of the Municipal Arena, at rates other than the rates described below. However, any such agreement shall require the approval of the City Council.

ORDINANCE

Page 4 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (1) Municipal Fairgrounds main baseball field fees:
 - I. Single game: \$60 per game, plus \$50 for lights.
 - II. Doubleheader (same teams): \$90 per two games, plus \$50 for lights.
 - III. Performances: \$1,000 per day; \$500 per day to reserve the field prior or post event; plus additional expenses agreed upon and included in the contract.

- (2) Municipal Fairgrounds main multipurpose fields:
 - I. \$60 per game or \$30 per hour, plus \$50 for lights.

- (3) Municipal Fairgrounds horse ring:
 - I. \$60 per show.

- (4) Municipal Fairgrounds rental:
 - I. \$200 per day.

- (5) Other athletic fields [NOTE: Other athletic fields include Fairgrounds (3), Marble Street (2), North Elementary (5), and Kostyk Field (1)].
 - I. Single games: \$30 per game, plus \$25 for lights.
 - II. Doubleheader (same teams): \$45 per two games, plus \$25 for lights.
 - III. Performances: \$1,000 per day; \$500 per day to reserve the field prior or post event; plus additional expenses as agreed upon and included in the contract.

ORDINANCE

Page 5 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (6) There shall be no charge for Watertown and IHC High Schools and Jefferson Community College to use City-owned fields for practice. Field assignments will be at the discretion of the Parks and Recreation Superintendent or her/his designee.
- (7) Chair and table rental:
 - I. Chair rental: \$0.50 per chair, per day.
 - II. Table rental: \$2.50 per table, per day or \$7 per table, per weekend.
 - III. This fee will not be charged for events taking place in the Municipal Arena.
 - IV. Events using City-owned tables and chairs must take place on Municipal Fairgrounds property.
- (8) All-day rental fee for City-owned fields:
 - I. Non-profit fundraising events: \$100 per day, per field, with one initial chalk lining per field. Each additional chalk lining, provided upon request of the user, shall cost said user \$25.
 - II. Regular events: \$250 per field, per day, with one initial chalk lining per field. Each additional chalk lining, provided upon request of the user, shall cost said user \$25.
- (9) Food concessions: Event promoters shall be charged a fee of \$250 per vendor, per event, for the right to allow food concessions at their event.
- (10) Parking: A \$3,000 fee will be charged to the concert/performance/show promoter when parking requires City staff assistance.

ORDINANCE

Page 6 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

(11) RV Sites:

- I. With utility hookup: \$20 per night.
- II. With no utility hookup: \$10 per night.
- III. Jefferson Country Agriculture Society during Jefferson County Fair Week (society will be responsible for payment to the City and for collection of fees from individual sites): \$75 per site per week.

C. Miscellaneous Parks and Recreation Fees: Various Parks and Recreation fees shall be established and enforced as follows. Nothing in this section shall prohibit the City from entering into an agreement for the use of the Municipal Arena, at rates other than the rates described below. However, any such agreement shall require the approval of the City Council.

(1) Tennis program:

- I. City residents: \$10 per person.
- II. Non-City residents: \$30 per person.

(2) Golf program:

- I. City Residents: \$20 per person.
- II. Non-City Residents: \$50 per person.

(3) Baseball and Softball Adult Leagues: \$150 per team.

(4) Baseball and Softball Youth Leagues (T-ball, Midget, Grasshopper):

- I. City residents: \$0 per child.
- II. Non-City resident: \$15 per child.

ORDINANCE

Page 7 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (5) Youth swimming lessons:
 - I. City residents: \$0 per child.
 - II. Non-City residents: \$20 per child.
- (6) Saturday Farmer’s Market at Municipal Fairgrounds: \$50 per day.
- (7) JB Wise parking lot covered walkway reservation fee: \$50 per reservation.
- (8) Thompson Park reservation fee:
 - I. City residents: \$5 per reservation.
 - II. Non-City residents: \$15 per reservation.
- (9) Fairgrounds pavilion reservation fee: \$50 per reservation.
- (10) Veteran’s Memorial pavilion reservation fee: \$50 per reservation.
- (11) Marble Park pavilion reservation fee: \$50 per reservation.
- (12) Alcohol permit processing fee:
 - I. City residents: \$5 per request.
 - II. Non-City residents: \$15 per request.
- (13) Fishing clinic:
 - I. City residents: \$15 per person.
 - II. Non-City residents: \$35 per person.

ORDINANCE

Page 8 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

Total

YEA	NAY

- (14) Family yoga:
 - I. City residents: \$10 per person.
 - II. Non-City residents: \$35 per person.
- (15) Scuba diving lessons:
 - I. City residents: \$20 per person.
 - II. Non-City residents: \$60 per person.
- (16) Kids zumba:
 - I. City residents: \$15 per child.
 - II. Non-City residents: \$35 per child.
- (17) Youth running club:
 - I. City residents: \$5 per child.
 - II. Non-City residents: \$20 per child.
- (18) Horseback riding lessons:
 - I. City residents: \$20 per person.
 - II. Non-City residents: \$60 per person.
- (19) Boot camp exercise program:
 - I. City residents: \$20 per person.
 - II. Non-City residents: \$50 per person.

ORDINANCE

Page 9 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

YEA	NAY

Total

(20) Volleyball team: \$200 per team.

(21) Kickball team: \$150 per team.

and,

BE IT FURTHER ORDAINED that Section A320-6 (A) of the City Code of the City of Watertown is amended to read as follows:

§ A320-6. Schedule of fees.

A. The fees for various City services are as set forth below.

Type	Fee
Fingerprint impressions:	\$ 2 per card
Record of conviction checks, local:	\$10 per check
Snow dump permit:	\$125 per truck; up to three (3) trucks per business; \$500 flat fee for four (4) or more trucks per business
Tax certification:	\$ 5
Tax search:	\$10
Trash tote service:	
32 gallon tote:	\$45.50 per quarter
64 gallon tote:	\$68.25 per quarter
95 gallon tote:	\$91 per quarter

ORDINANCE

Page 10 of 10

Amending City Municipal Code § A320,
Fees

Council Member BURNS, Roxanne M.
 Council Member BUTLER, Joseph M. Jr.
 Council Member MACALUSO, Teresa R.
 Council Member SMITH, Jeffrey M.
 Mayor GRAHAM, Jeffrey E.

YEA	NAY

Total

Trash tote deposit:

32 gallon tote

\$ 5 deposit

64 gallon tote

\$ 7 deposit

96 gallon tote

\$10 deposit

and,

BE IT FURTHER ORDAINED that Article VIII of the City Code of the City of Watertown is amended by to read as follows:

§ A320-9. (Reserved)

and,

BE IT FURTHER ORDAINED that this amendment shall take effect as soon as it is published once in the official newspaper of the City of Watertown, or printed as the City Manager directs.

Seconded by

**2013 Destination Marketing Proposal
to
City of Watertown
From
1000 Islands International Tourism Council**



Background:

The 1000 Islands International Tourism Council works as the “destination marketing organization” for the region including all of Jefferson County and neighboring Ontario communities along the St. Lawrence River.

As such, it engages in marketing projects designed to attract visitors to the region from outside the area. The Council's marketing projects leverage buy-in from governments, non-profits and business partners.

In 2013, the Council's budget goal is \$1,044,905. With supplemental grants and custodial initiatives, the total 2013 funding will be \$1,468,905. Over half of the base program budget comes from the two largest investors in the Council. The 1000 Islands Bridge Authority/Federal Bridge Corporation of Canada provides staff and services. Jefferson County provides a program grant in the amount of \$325,000. In addition to that base funding, the County will be forwarding \$150,000 for several special projects. This year's funding from State of New York Matching funds program is \$86,030. The Council is also working on two state funded special projects totaling \$144,000 and is acting as the regional sponsor of the \$100,000 New York Path Through History project.

The balance of funding comes from many businesses and organizations who, like the City of Watertown, “buy-in” to the Council's programs.

As the official Jefferson County Tourism Promotion Agency, the 1000 Islands International Tourism Council includes promotions of Watertown based attractions, events and hospitality services in all its regular programs. The buy-in list is for additional exposure or support of special projects.

Challenges and Opportunities

As growth has occurred in the City of Watertown and adjacent municipalities, new tourism opportunities and challenges are emerging. The Watertown Area now has both the capacity and the need to maintain a year-round tourism marketing effort.

From 2006 to 2012, the number of rooms in the Watertown/Fort Drum area grew from 928 to 1,541. That's 66% growth in six years. Looking at it another way, there will be 223,745 more room nights to sell in 2012 than there were in 2006. The community has also seen an expansion of general retail and food service during the same time. Sales tax records show that the County's taxable sales are well above what can be supported by the resident population.

2012-13 City of Watertown Destination Marketing Sponsorships and Buy-ins

Core Programs

Watertown positioning in 1000 Islands regional marketing: \$14,250

The programs position Watertown within overall 1000 Islands branded marketing

2013 Summer Marketing Program

\$8,750 for major partner position

The TIRTDC will place about \$120,000 in cooperative television advertising in key markets including Rochester, Buffalo, Scranton/Harrisburg, Northern New Jersey and Ottawa. For 2013, plans also call for placement of \$30,000 in online banner ads on key websites in Upstate New York, Eastern Ontario and Central Pennsylvania and Northern New Jersey.

Partnership packages have been developed for the summer campaign. Utilizing cable systems and broadcast channels, over 5,000 TV spots are expected to be aired. Each major partner receives coverage in a rotation of the TV cooperative ads, impressions in a rotation of the online campaign, a feature in the summer calendar of events tabloid (12,000 copies) , and a featured position on the campaign landing-site (getaway1000.com) .

2014-15 International Travel Guide

\$5,500 for a full page ad in color

The Council's main consumer travel piece is the *1000 Islands International Travel Guide*. 275,000 copies of the Guide are published. The guides are direct mailed to all advertising inquiries, as well as the previous year's inquiries. The Guide is carried as an official publication in both New York and Ontario welcome centers. Thousands are distributed at consumer shows by the TIRTDC and cooperating partners

It should be noted that editorial content about the City and local businesses is underwritten by the Council's Jefferson County grant. This request is for display ad space which will be designed to the City's specifications and can highlight a number of tourism sites in Watertown.

Core Programs

Watertown Area branded projects: \$27,600

These programs are Watertown branded marketing

Watertown Canadian Shop, Stay & Save: \$15,000

Total investment goal \$45,000 (underwriting requested from City: \$15,000)

With the Canadian dollar continuing to trade around par, the Watertown Area has proven to be very attractive to Canadian shoppers from throughout eastern Ontario. Beginning in 2010, the Council has received support from the City and Town of Watertown to conduct a fall marketing effort targeting Ontario Shoppers. Working with the Watertown Times, a 16-page tabloid was produced and inserted into newspapers in Ottawa, Kingston, Brockville and Gananoque (115,000 copies total).

Display ads were taken during September and October in Ottawa, Kingston and Brockville Newspapers. A Google Adwords campaign directed traffic to the VisitWatertown.com site.

The visitwatertown.com website was re-designed around the shopping promotion and in Google Adwords targeted eastern Ontario communities.

Based on input from Watertown Area lodging businesses, the Council will continue the fall shopper promotion in 2013 and solicit additional support to expand the program.

Winter Visit campaign: \$10,000

Total investment goal \$25,000 (underwriting requested from City: \$10,000)

The most difficult time to attract visitors and fill rooms is the January – April timeframe. In 2013, the Council initiated a Winter Visit campaign targeting nearby communities in Northern New York and Eastern Ontario. The campaign included television ads in the Northern New York market, as well as print and internet advertising targeting both New York and Ontario.

The Council developed a special “landing site” at www.wintervisit.com to promote lodging packages and winter activities.

The 2014 program will work to target visits during school breaks in Ontario and New York, encouraging families that may not have the time or financial resources to take a southern vacation to make a short break in the North Country. The campaign will promote “pool & play” lodging packages, shopping, winter recreation and special events.

2013-2014 Seaway Trail “Journey” Magazine: \$2,600 – 2/3 page ad

The Seaway Trail annually publishes its *Journey* magazine covering communities and activities along the Seaway Trail from Massena to Erie, Pennsylvania. A 2/3 page ad would promote Watertown in this publication with a press run of 200,000.

This keeps Watertown highly visible in the overall Seaway Trail program. In addition to the Watertown ad, other communities in Jefferson County sponsor cooperative pages in *Journey*. The Tourism Council also supports the Seaway Trail’s marketing fund with a \$5,000 annual investment that is pooled with similar investments from other Seaway Trail Counties.

2013 Marketing Proposal Cost Summary:

Participation in 1000 Islands branded projects:

- 2013 Summer Marketing Program, Major Partner\$8,750
- 1000 Islands International Travel Guide Ad\$5,500
- Subtotal:*.....\$14,250

Support of Watertown Area branded projects:

- Fall season Visit Watertown campaign\$15,000
- Winter break campaign\$10,000
- Seaway Trail Journey Magazine\$2,600
- *Subtotal*.....\$27,600

Total core marketing programs\$41,850

Notes regarding on-going Tourism Council projects of special interest to Watertown:

Watertown Visitors Map

An 11" x 17" color map of the Watertown Area is produced for use in providing directions to visitors. The map includes street level details along with the locations of hotels, major shopping areas and points-of-interest. Hotel desks and other visitor service areas receive the maps in pads of 50.

Brochure Distribution

The Council is very active in brochure distribution. It regularly stocks literature displays in two I-81 rest areas in Jefferson County, operates the Welcome Center at the Thousand Islands Bridge and mails tens of thousands of "visitor kits" annually. The literature projects in this proposal are backed by that distribution system and other City attractions are encouraged to take advantage of the distribution as well.

I-81 Initiative

The Council was successful in applying for an \$84,000 New York State grant to develop a program to promote travel along the I81 corridor. The project involves developing an online and print exit guide for the highway and promoting the corridor using Internet advertising. The Council will work with partner tourism offices in Oswego County, Syracuse and Binghamton to complete the project.

Black River Marketing

With the support of the City and State of New York through the Blueway initiative coordinated by the Tug Hill Commission, a number of Black River marketing projects have been implemented and continue.

During 2013 a complete re-design and relaunch of the BlackRiverNY.com website will be completed utilizing grant funds from the Department of State.

Watertown Airport Marketing

The Council is currently working on a \$50,000 project to promote use of the Watertown Airport, especially targeting Eastern Ontario. A billboard advertising the Airport will be displayed on I81 from July-December. The Airport will also be promoted in consumer and business publications. Launch of a new website at www.WatertownAirport.com will be promoted with a social media and online advertising campaign. American Airlines has been asked to support the program by making \$9,000 in tickets available for a contest promotion associated with the campaign.

Fort Drum VFR

The Council continues to work toward promoting visits to the region by friends and relatives of personnel stationed at Fort Drum. It will continue to distribute literature on post and develop literature targeting military visitors.

Disabled Persons Action Organization

617 Davidson Street, Box 222

Watertown, NY 13601

Cynthia L. FitzPatrick

Executive Director

Tel: 315-782-3577

1-800-533-2859

Website: dpao.org

Fax: 315-782-6673

May 21, 2013

Ms. Sharon Addison
City Manager
City of Watertown
Room 302
Municipal Building
245 Washington Street
Watertown, New York 13601



Dear Sharon:

The Disabled Persons Action Organization (DPAO) thanks the City of Watertown for their past support in receiving Bed Tax Revenue to assist our agency in promoting our Summer Concert Series. The funds are essential as it allows us to advertise and promote our four summer concerts outside of the Jefferson County Region which helps attract thousands of tourists to the Watertown area each summer.

DPAO is preparing for our upcoming summer shows and respectfully requests funding from the City of Watertown Tourism Fund, in the amount of \$5,000, to assist us in promoting our 2013 Summer Concert Series. DPAO will promote and publicize the advantages of the City of Watertown through an extensive Marketing and Advertising Campaign which will include Radio, TV, Newspaper, etc.

DPAO is a not-for-profit, tax exempt organization whose mission is to provide quality and effective individualized services to developmentally disabled children and adults in Jefferson and Lewis Counties. The services are primarily geared to helping families cope with the stress of caring for their disabled loved ones in their own homes.

DPAO's annual concert series generate funds that enable the agency to expand services beyond what government resources can support thus providing vitally needed opportunities to over 500 families with developmental disabilities. Receiving additional individualized support has made it possible for people with disabilities to remain at home where there is more love and attention, than placement in a more costly community residence or other facility.

DPAO's Summer Concert Series brings thousands of concert goers to the Watertown Area each year to watch some of the best entertainers in the world! The City of Watertown, along with many, many businesses, etc. benefits from the revenue generated from these visitors who stay in the hotels, eat in the restaurants and purchase items from area businesses.

DPAO thanks the City of Watertown in advance for your time and consideration for this most important matter. Please contact me with any questions or if you need additional information.

Sincerely,

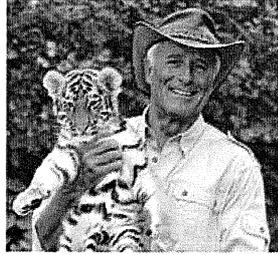
A handwritten signature in black ink, appearing to read "J. Rich".

Joseph L. Rich
Vice President
DPAO Board of Directors



**DPAO / TOYOTA / CAR-FRESHNER
2013 Summer Concert Series**

Find us on Facebook



**Jack Hanna's
Into The Wild Live**

Saturday, May 25th at 4 pm
Watertown Fairgrounds Arena



**Rodney Atkins
With Jana Kramer**

Sunday, June 23rd at 7 pm
Watertown, Fairgrounds Arena



Randy Travis

Saturday August 3rd at 7pm
Watertown Fairgrounds Arena



**KC and the Sunshine Band
With Village People**

Friday, August 9th at 7 pm
Watertown Fairgrounds Arena



For Reserved Tickets:
Visit our website at
www.DPAO.org
Or by calling 782-0044

General Admission Tickets are Available at
Select Kinney Drugs Store Locations
Price Chopper Supermarkets

Major Sponsors

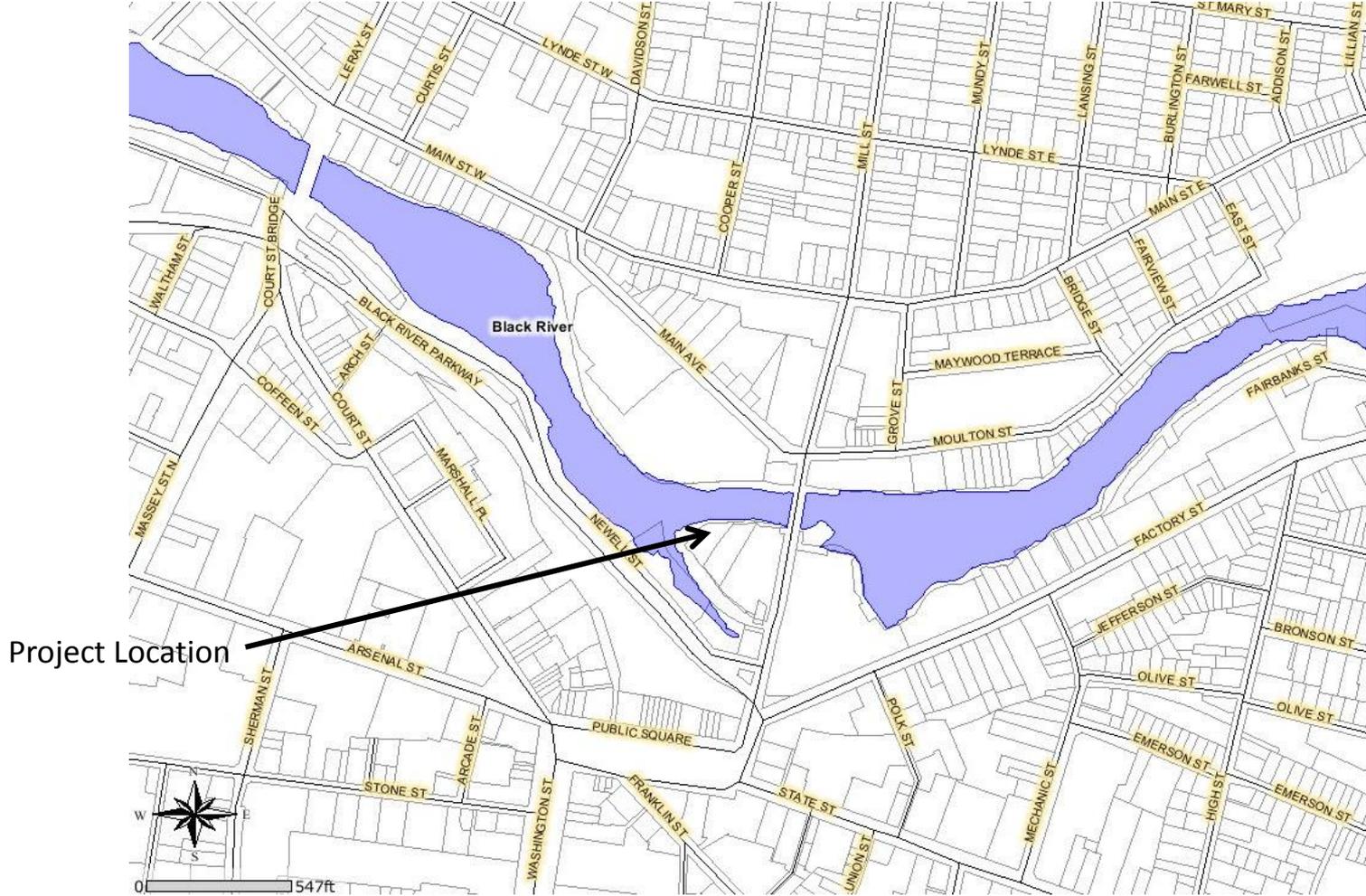


Town of Watertown

Judy & Steven McAllister-Gunn



City of Watertown Snow Dump Platform Replacement Project Location



City of Watertown Snow Dump Platform Replacement Function & Stakeholders

- Provides snow dumping capability to the City of Watertown, other municipalities and private haulers

- For the 2012-13 Season:
 - 31 Permits Issued
 - Top 5 permit holders: TJ Clement (13), Jefferson County (5), Marzano Excavating (3), Granger Landscaping (2) & John Marcinko (2)

City of Watertown Snow Dump Platform Replacement Site Location

Dump Platform

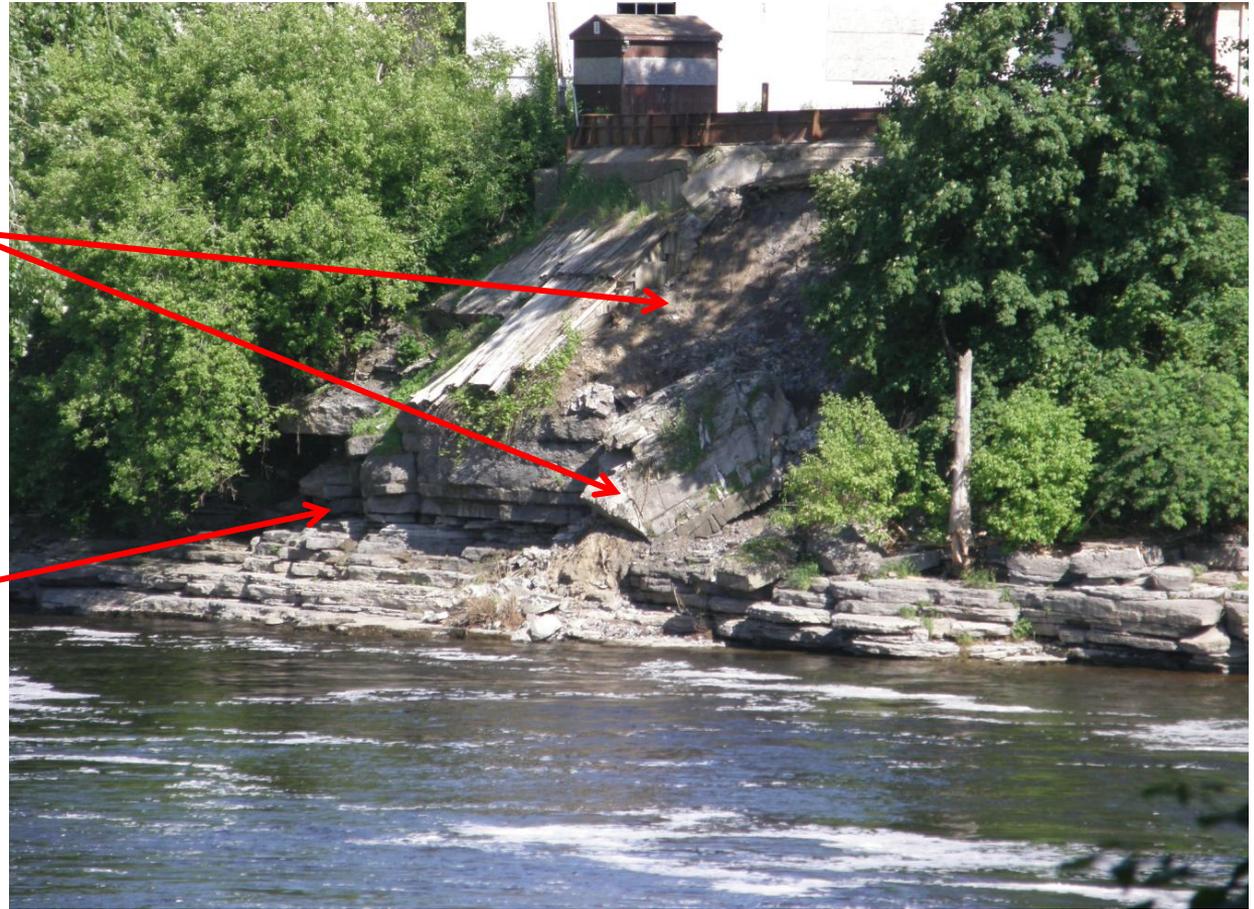


Chute

City of Watertown Snow Dump Platform Replacement Current Condition

Failure of Concrete
Chute

Area of Proposed
Concrete Scour Repair

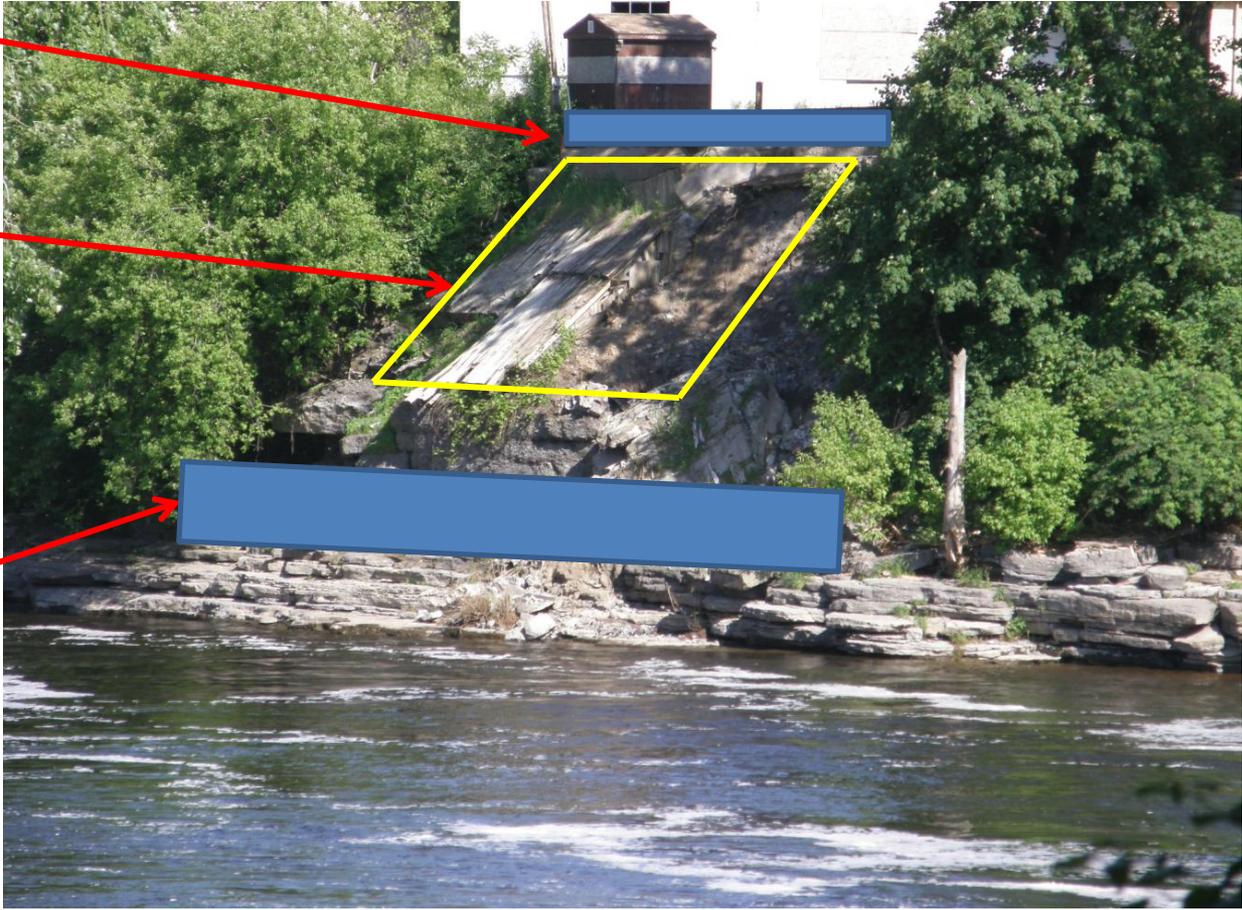


City of Watertown Snow Dump Platform Replacement Proposed Replacement

Proposed Concrete
Dump Platform
Replacement:

Proposed Concrete
Chute Replacement:

Area of Proposed Concrete
Scour Repair: 25 CY
Approx. 3' (w) x 5' (h) x 45' (l)



City of Watertown Snow Dump Platform Replacement Project Overview

- Used as a snow dump site since the 1940's.
- Last repairs made approx. 20 years ago.
- Project removes and replaces existing concrete slab and chute.
- Will require USACoE Nationwide Permit and NYSDEC Water Quality Permit prior to starting work.
- Construction window for CY 2013 is July-early September or will need to shift to same period in CY 2014.
- Unsure of permit ramifications if site ceases to be an active snow dumping site for a period of time.
- Estimate: \$85,000-\$100,000 (Pre-design 2011)
- Capital budget 12-13: \$90,000
- If Council approves proceeding with the project, preliminary plans will be finalized a to submit permits, and will proceed with final design.

PREVENTION
AGENDA

2013 - 2017

PREVENTION OF TOOTH DECAY

JUNE 10, 2013

Jay Kumar, DDS, MPH

Why Do Cavities Matter?

- Infection
- Extreme pain
- Difficulty in chewing
- Poor weight gain
- Difficulty concentrating
- Missed school hours
- Predictor of caries in later life
- Costly treatment



Facial Cellulitis



Dental Caries



Dental Extraction



Dental Caries

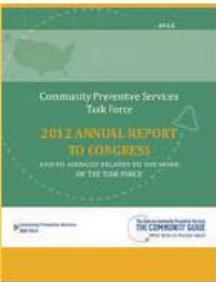
Strategies for controlling tooth decay

The Community Guide – What Works

3

The Guide to Community Preventive Services
THE COMMUNITY GUIDE
What Works to Promote Health

▶ Community Preventive Services Task Force



Task Force Releases 2012 Annual Report to Congress

Highlights include activities, evidence gaps, future systematic reviews, and how Task Force recommendations have been used to improve public health.

1 2 3 4

Task Force

2013 Meetings

June 19–20
 October 23–24

Annual Reports to Congress

Text Size: [S](#) [M](#) [L](#) [XL](#)

✉ Get Email Updates

Submit your email address to get updates on The Community Guide topics of interest.

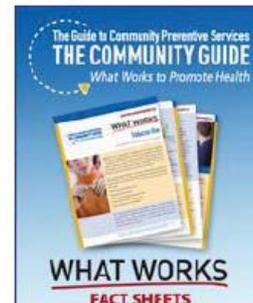
Your email address

[Submit](#) [What's this?](#)

Topics

Adolescent Health	Diabetes	Motor Vehicle Injury	Social Environment
Alcohol - Excessive Consumption	Emergency Preparedness	Nutrition	Tobacco
Asthma	Health Communication	Obesity	Vaccination
Birth Defects	Health Equity	Oral Health	Violence
Cancer	HIV/AIDS, STIs, Pregnancy	Physical Activity	Worksite
Cardiovascular Disease	Mental Health		

What is The Community Guide?



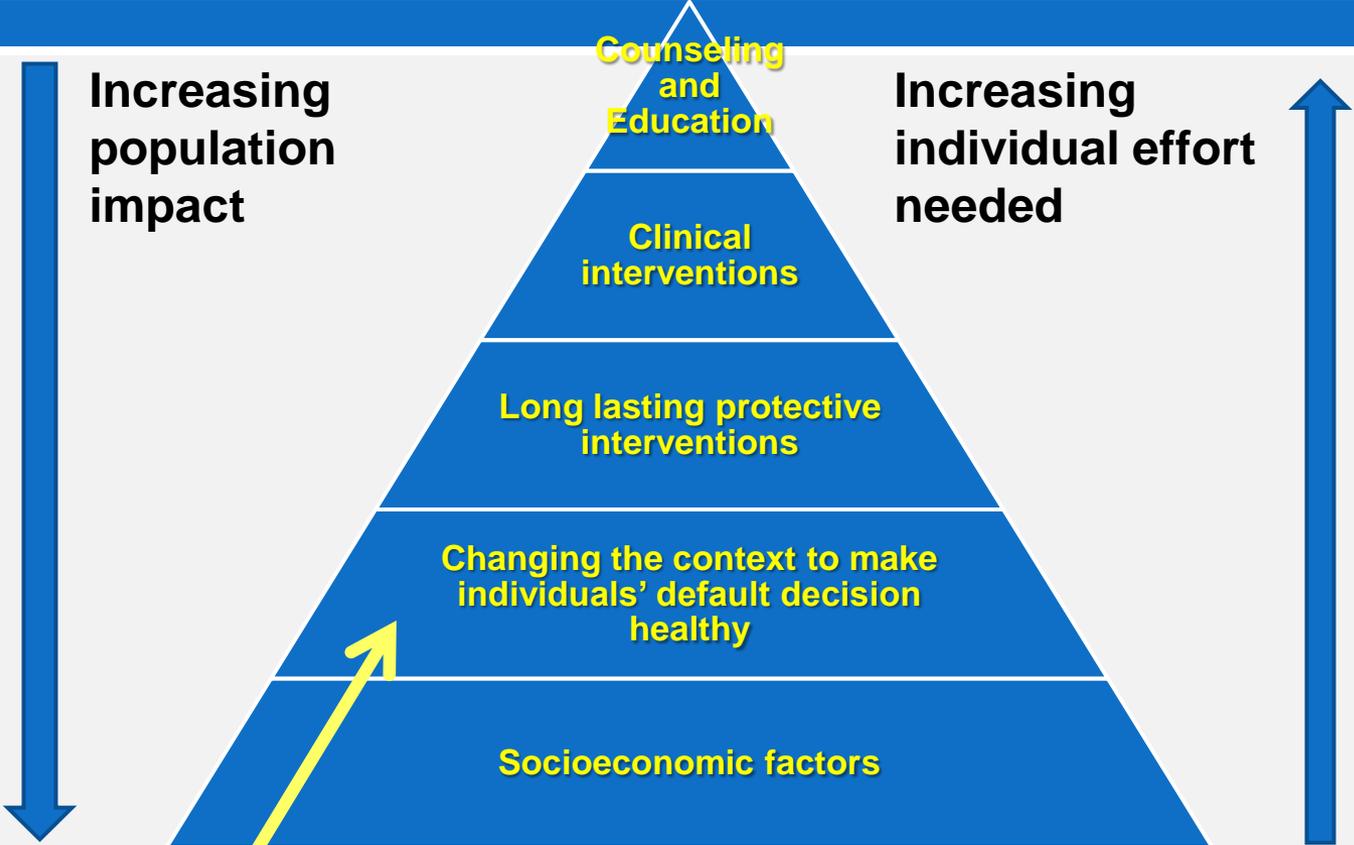
Community Water Fluoridation

School-Based Dental Sealant Delivery Programs

Recommended

Recommended

New York State's Health Improvement Plan



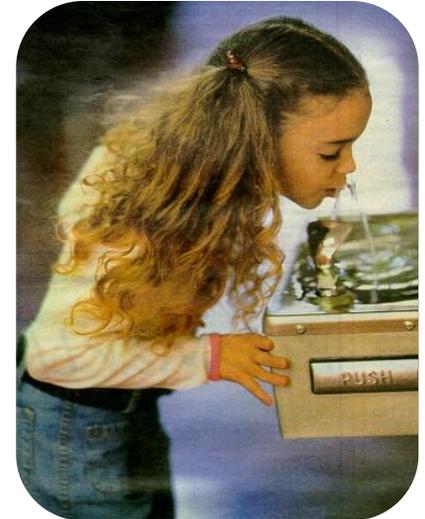
THE COMMUNITY GUIDE
Community Water Fluoridation

Recommended

Why Water Fluoridation?

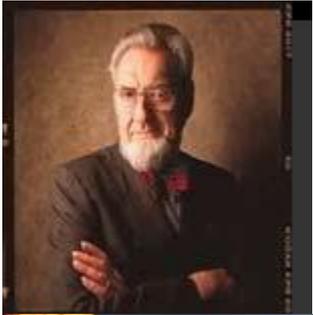
5

- ❑ Reduces cavities - for both children and adults
- ❑ Helps Americans keep their teeth
- ❑ Saves millions in treatment costs and eliminates pain and suffering
- ❑ Nearly every large city and more than 204 million Americans benefit
- ❑ CDC: One of 10 great public health achievements of the 20th century



Source: Pew Children's Dental Campaign

A Public Health Achievement



“Fluoridation is the single most important commitment a community can make to the oral health of its children and to future generations.”

Dr. C. Everett Koop

Surgeon General (1982-1989)



“Fluoridation is the single most effective public health measure to prevent tooth decay and improve oral health over a lifetime, for both children and adults.”

David Satcher, MD, PhD

Surgeon General (1998-2002)



“With the development of fluoridated drinking water and dental sealants, Americans are less likely to experience tooth loss and gingivitis by middle age ... Community water fluoridation continues to be a vital, cost-effective method of preventing dental [cavities].”

Dr. Regina Benjamin,

U.S. Surgeon General (2009-current)

The Cost and Effectiveness of School-based Preventive Dental Care

STEPHEN P. KLEIN, PHD, HARRY M. BOHANNAN, DMD, ROBERT M. BELL, PHD,
JUDITH A. DISNEY, DMD, CRAIG B. FOCH, MA, AND RICHARD C. GRAVES, DDS, DRPH

Abstract: The National Preventive Dentistry Demonstration Program assessed the cost and effectiveness of various types and combinations of school-based preventive dental care procedures. The program involved 20,052 first, second, and fifth graders from five fluoridated and five nonfluoridated communities. These children were examined at baseline and assigned to one of six treatment regimens. Four years later, 9,566 members of this group were examined again. Analyses of their dental examination data showed that dental health lessons, brushing and flossing, fluoride tablets and mouthrinsing, and professionally applied topical fluorides were not

effective in reducing a substantial amount of dental decay, even when all of these procedures were used together. Occlusal sealants prevented one to two carious surfaces in four years. Children who were especially susceptible to decay did not benefit appreciably more from any of the preventive measures than did children in general. Annual direct per capita costs were \$23 for sealant or fluoride prophylaxis applications and \$3.29 for fluoride mouthrinsing. Communal water fluoridation was reaffirmed as the most cost-effective means of reducing tooth decay in children. (*Am J Public Health* 1985; 75:382-391.)

“The study strongly reaffirmed the value of communal water fluoridation... The reductions in decay attributable to water fluoridation in both cohorts are therefore almost the same as those obtained in these cohorts with sealants. However, in contrast to the \$23 per year cost of maintaining a child in a sealant program, the annual per capita cost (in 1981 dollars) of water fluoridation in five United States communities ranged from \$0.06 in Denver, Colorado to \$0.80 in rural West Virginia.”

Is Water Fluoridation Still Necessary?

8

J.V. Kumar. *Adv Dent Res* 20:8-12, July, 2008

"YORK"	Changes in caries prevalence	-15%* (-64%, 5%)
	Differences in dmft/DMFT	-2.25 (-0.5, -4.4)
Community Guide	Changes in caries at the tooth level (deft/DMFT)	
	Effect of starting or continuing CWF	-29.1% (-110.5%, 66.8%)
	Effect of stopping CWF	17.9% (-42.2%, 31.7%)
	Changes in caries at the tooth level (deft/DMFT)	
	Effect of starting or continuing CWF	-50.7% (-68.8%, -22.3%)
	Effect of stopping CWF	59.90%
Additional Systematic Review - Effectiveness in Adults		
Griffin et al (2007)	Preventive Fraction	27.2% (19.4, 34.3)

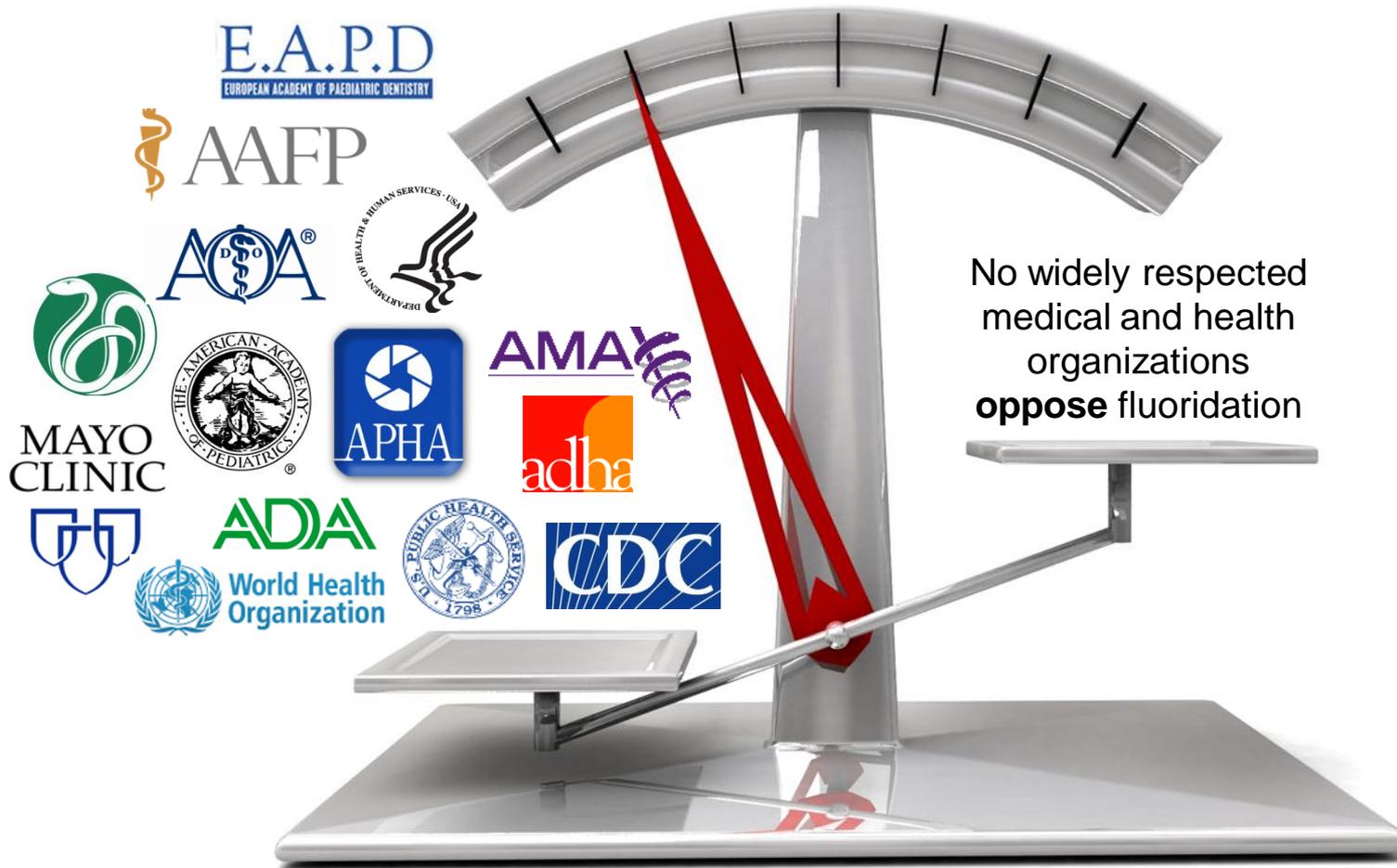
Reviews – Benefits & Safety

(Expert committees; systematic reviews)

9

- U.S. Guide to Community Preventive Services (2002), Updated in April 2013
- EPA Reports (2012)
- Scientific Committee on Health and Environmental Risks of the European Commission (SCHER 2011)
- Health Canada Report on Fluoride and Human Health (2008)
- National Health and Medical Research Council, Australian Government (2007)
- National Research Council, U.S.A. (1993, 2006)
- World Health Organization (1994, 1996, 2006)
- Agency for Toxic Substances and Disease Registry, U.S. Public Health Service (2003)
- International Programme on Chemical Safety, W.H.O. (2002)
- Forum on Fluoridation, Ireland (2002)
- Medical Research Council, U.K. (2002)
- U.S. Surgeon General's Report (2000)
- CDC. Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States (2001)
- University of York, U.K. (2000)
- Institute of Medicine, U.S.A. (1999)
- U.S. Public Health Service (1991)
- New York State Department of Health (1990)

The Weight of Science



No widely respected
medical and health
organizations
oppose fluoridation

Fluoridation in New York State

11

- Fluoridation efforts started in 1945
- Focus on research and evaluation - over 40 publications
- Approximately 12.9 million residents or approximately 71.4% on public water supplies receives fluoridated water
- Target is 78.5%;% by 2017 (Baseline: 71.4%;
Prevention Agenda 2013-2017)

Geographic Variation in Medicaid Claims for Dental Procedures in New York State: Role of Fluoridation Under Contemporary Conditions

JAYANTH V. KUMAR, DDS, MPH^{a,b}

OLUBUNMI ADEKUGBE, BDS,
MPH^c

THOMAS A. MELNIK, DRPH^d

SYNOPSIS

Objective. We conducted an evaluation to determine if the number of claims reimbursed for caries-related procedures for children in the New York State Medicaid program varied by county fluoridation coverage.

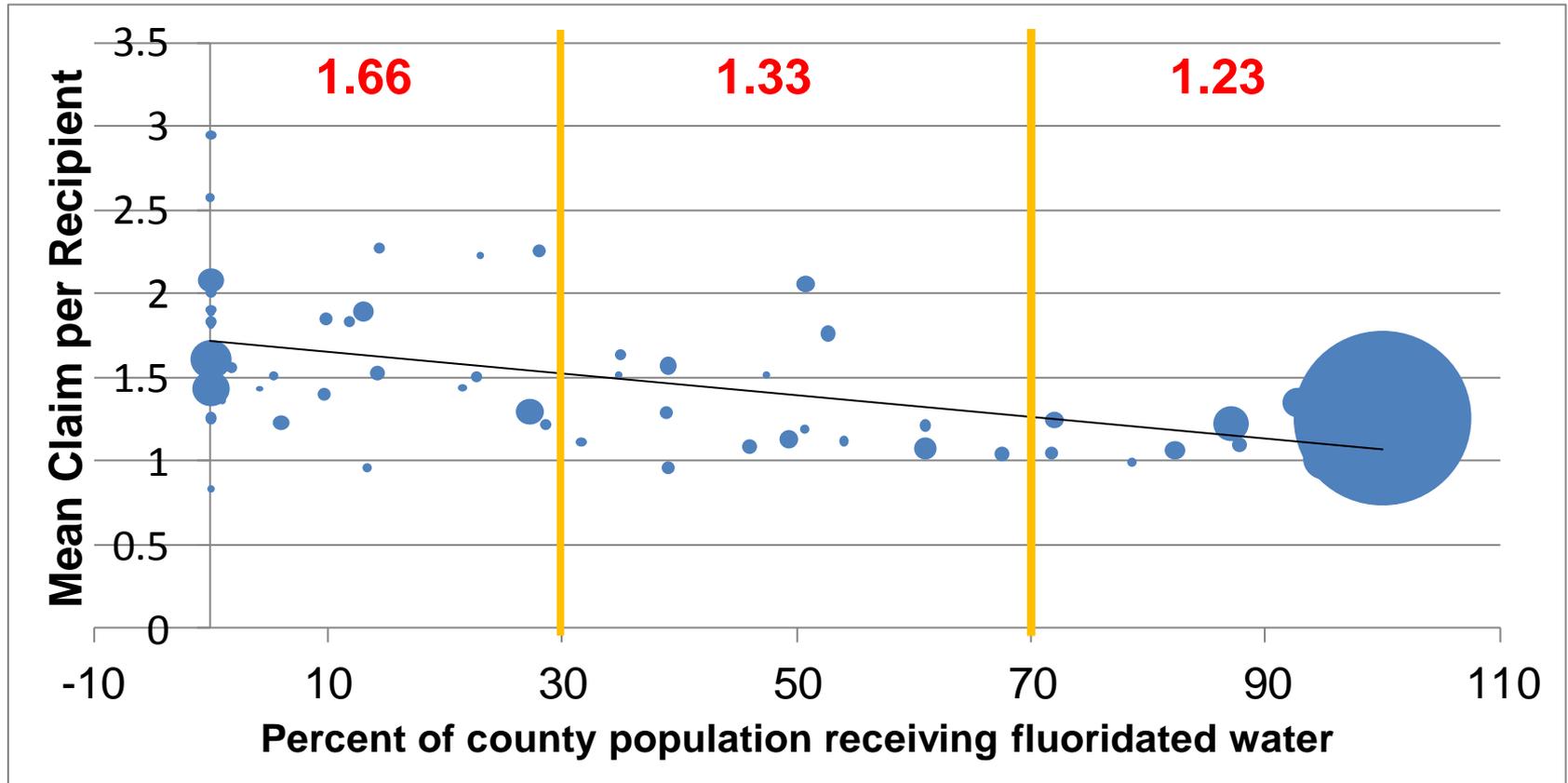
Methods. We calculated the mean number of claims per recipient for children in each county separately for the treatment of caries and all other procedures not related to caries using the 2006 Medicaid claims data.

Results. Compared with the predominantly fluoridated counties, the mean number of restorative, endodontic, and extraction procedures per recipient was 33.4% higher in less fluoridated counties. The mean number of claims per child for caries-related services was inversely correlated with the extent of fluoridation in a county (Spearman's correlation coefficient = -0.54 , $p < 0.0001$), but claims for non-caries related services were not.

Conclusions. These findings, when added to the already existing weight of evidence, have implications for promoting policies at the federal and state levels to strengthen the fluoridation program.

Mean claim per recipient for caries related procedures was correlated with county fluoridation status

13



Spearman Correlation Coefficient -0.53 ($p < 0.01$).

Each bubble denotes the size of the Medicaid population.

Savings from Water Fluoridation: What the Evidence Shows

14

- Louisiana: A statewide analysis of Louisiana Medicaid reimbursements for caries-related procedures delivered to children, aged 1 to 5 years - Savings \$66.8 per child
- A Texas study confirmed that the state saved \$24 per child, per year in Medicaid expenditures.
- A 2010 study in New York State – Savings of \$23.65 in treatment costs for children (0-20 yrs.) enrolled in Medicaid.
- Researchers estimated that in 2003 Colorado saved nearly \$149 million in unnecessary treatment costs by fluoridating public water supplies—average savings of roughly \$61 per person.
- CDC estimate for large communities - \$1 invested saves \$38 in treatment cost

National Research Council

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Report issued in March 2006

Focused on naturally occurring high levels of fluoride in drinking water

Reviewed studies:

Effects of Fluoride on Teeth

Musculoskeletal Effects

Reproductive and Developmental Effects

Neurotoxicity and Neurobehavioral Effects

Effects on the Endocrine System

Effects on the Gastrointestinal, Renal, Hepatic, and Immune Systems

Genotoxicity and Carcinogenicity



States with high levels of fluoride naturally occurring:

Colorado 11.2 mg/L

Oklahoma 12.0 mg/L

New Mexico 13.0 mg/L

Idaho 15.9 mg/L

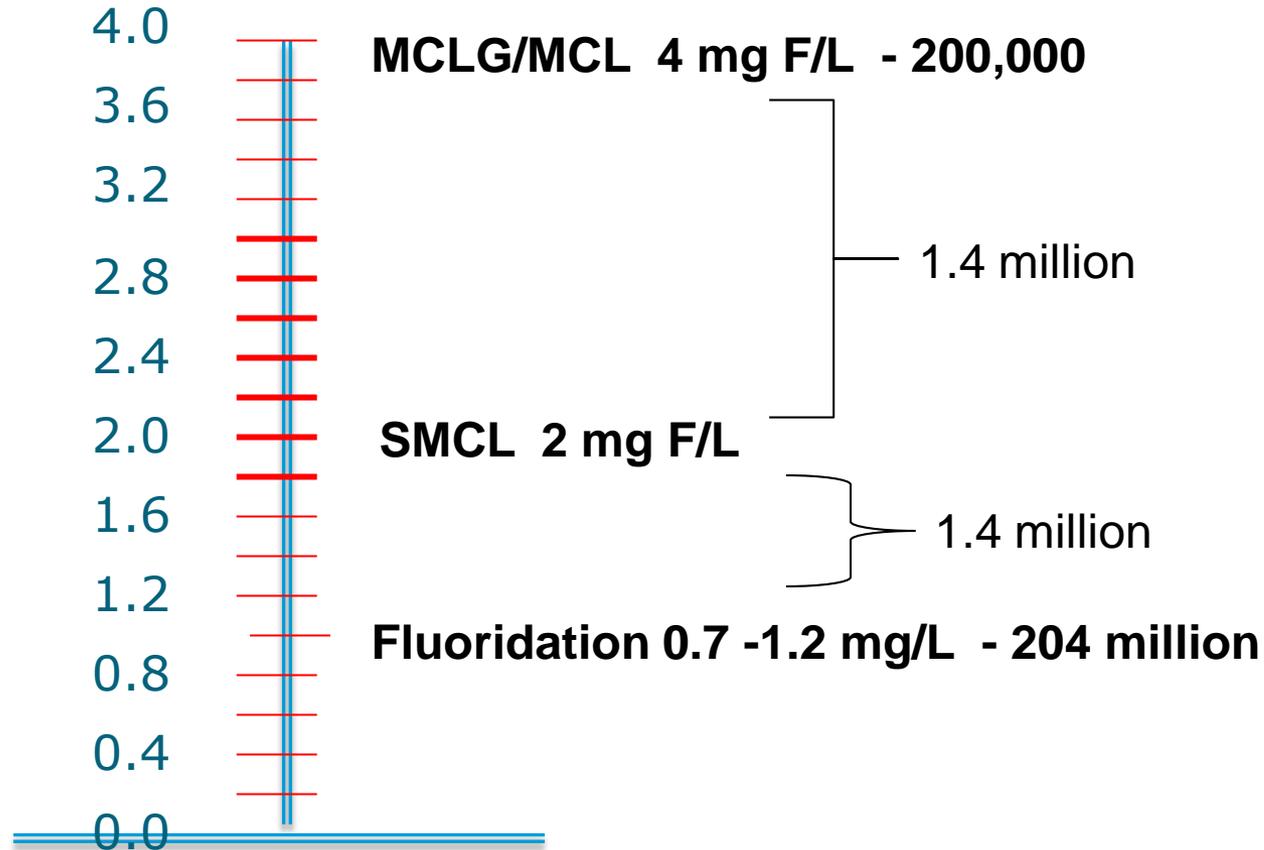
Virginia 6.3 mg/L

Texas 8.8 mg/L

S. Carolina 5.9 mg/L

Fluoride in Drinking Water: Regulations and Recommendations

16



National Research Council Report – Fluoride in Drinking Water (2006)

17

- The Committee considered three toxicity end points for which there were *sufficient relevant* data for assessing the adequacy of the MCLG (4 mg/L) for fluoride to protect public health:
 - ❖ severe enamel fluorosis, skeletal fluorosis, and bone fractures. (page 346)

Statement by John Doull, Chairman, NRC Committee:

“I do not believe there is any valid scientific reason for fearing adverse health conditions from the consumption of water fluoridated at the optimal level.”

Which sets of teeth have mild fluorosis?



Sample A



Sample B



Sample C



Sample D

Tooth Decay



Tooth Defects –
Cause unknown



Mild Dental Fluorosis

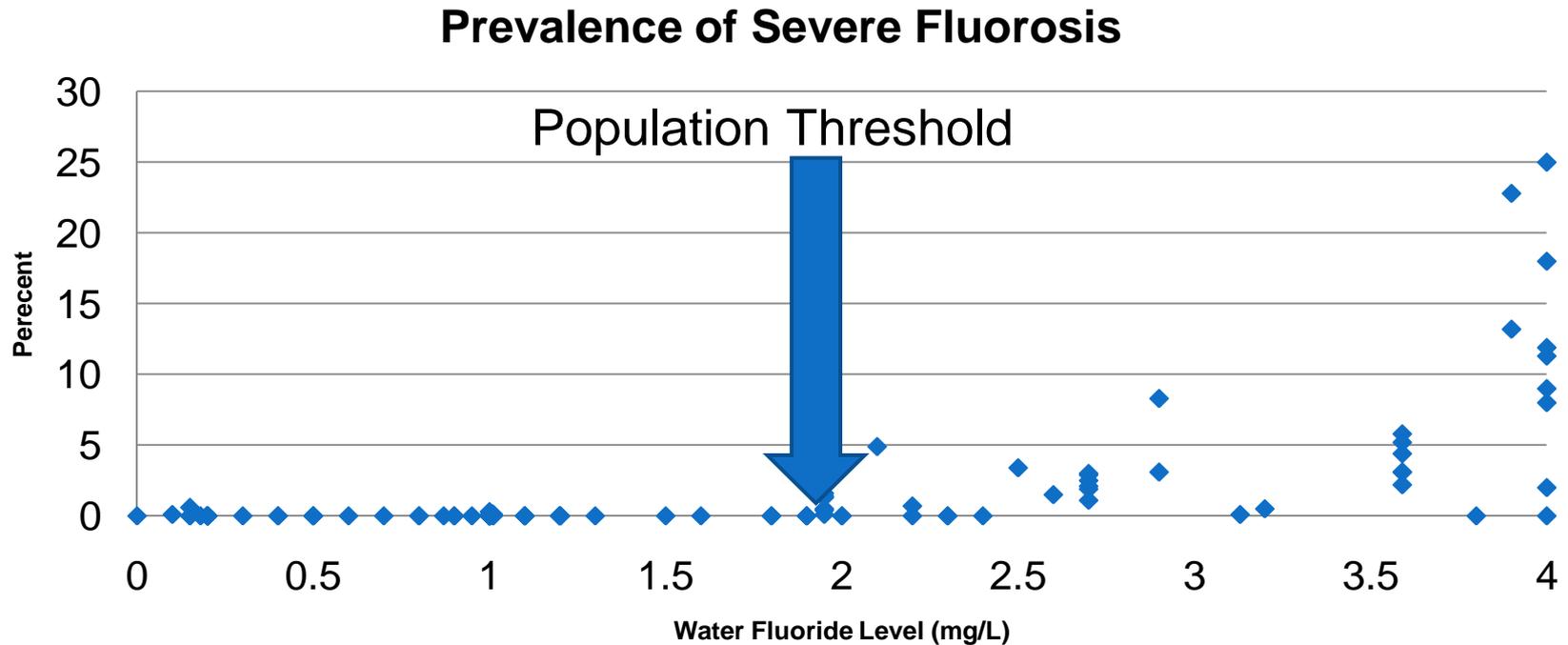


Severe Dental Fluorosis



Fluoride in Drinking Water and Severe Enamel Fluorosis

20



Strong evidence exists that the prevalence of severe enamel fluorosis is nearly zero at water fluoride concentrations below 2 mg/L.

2006 National Research Council Report – page 346,

NRC Recommendation: Reduce the MCLG of 4 mg/L

21

<u>Water fluoride</u>	<u>Prevalence</u>
4 mg/L	~10%
<2 mg/L	~0%

- Conclusion that the MCLG should protect against severe enamel fluorosis is consistent with recommendations of Institute of Medicine (IOM).
- IOM (1997)
 - Age-specific tolerable upper intake levels (UL)
 - Set to reduce moderate enamel fluorosis

Claims

22

- ▣ Not needed, doesn't work, small effect , there are alternatives
- ▣ Lower IQ in children
- ▣ Increases lead uptake
- ▣ Cancer
- ▣ Down's syndrome
- ▣ Allergies
- ▣ AIDS
- ▣ Alzheimer's disease
- ▣ Reproductive problems
- ▣ Effects on the renal, gastrointestinal, and immune systems

How Claims Against Fluoridation are Assessed?

23

- **Can Fluoridation Affect Water Lead Levels and Lead Neurotoxicity?** Urbansky ET, Schock MR. Intern Environ Studies 2000.
- **Sodium Hexafluorosilicate [CASRN 16893-85-9] and Fluorosilicic Acid [CASRN 16961-83-4]. Review of Toxicological Literature.** Karen E. Haneke, Bonnie L. Carson. 2001.
- **Fate of fluorosilicate drinking water additives.** Urbansky, ET. Chem. Rev. 2002.
- **Blood Lead Concentrations in Children and Method of Water Fluoridation in the United States, 1988–1994.** Mark D. Macek, Thomas D. Matte, Thomas Sinks, and Dolores M. Malvitz. 2005.
- **Bioavailability of fluoride in drinking water: a human experimental study.** Maguire A, Zohouri FV, Mathers JC, Steen IN, Hindmarch PN, Moynihan PJ. 2005.
- **Reexamination of Hexafluorosilicate Hydrolysis by ^{19}F NMR and pH Measurement.** W. Finney, E. Wilson, A. Callender, M. Morris, L. Beck. 2006.

Claim: *Fluoridation chemicals are different from naturally occurring fluoride*

24

Pharmacokinetics of ingested fluoride: Lack of effect of chemical compound

G.M. Whitford^{a,*}, F.C. Sampaio^b, C.S. Pinto^c, A.G. Maria^c, V.E.S. Cardoso^d,
M.A.R. Buzalaf^c

Archives of Oral Biology (2008)

Conclusions: Considered together with published reports, the present findings support the conclusion that the major features of fluoride metabolism are not affected differently by the chemical compounds commonly used to fluoridate water nor are they affected by whether the fluoride is present naturally or added artificially.

New York's Commitment

25

- Conducted studies starting from 1945
- Over 40 reports
 - Benefits and risks
 - Fluoride intake
 - Enamel fluorosis
 - Osteosarcoma
- Conducted reviews, symposia and training
- Participated in national expert panels

Claim: *Fluoridation causes a decrease in IQ*

26

FACT: Low quality studies of IQ effect from high fluoride communities in China

“In our appraisals we found that the study design and methods used by many of the researchers had serious limitations. The lack of a thorough consideration of confounding as a source of bias means that, from these studies alone, it is uncertain how far fluoride is responsible for any impairment in intellectual development seen.”

Bazian. “Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ. A report for South Central Strategic Health Authority. February 2009.”

Arsenic and Fluoride Exposure in Drinking Water: Children’s IQ and Growth in Shanyin County, Shanxi Province, China. *Environ Health Perspect.* 2006;115:643–647.

Ecologic study; cause or effect? “This region is very poor even by Chinese standards”; Sampling? Measurement of IQ, F and As? Confounders? = **Low Quality**

	Villages			Control	Shanxi	China
	HSD	NJF	YY			
	High Fluoride					
Water fluoride (mg/L)	7.4	8.6	9.2	0.5		
	±2.1	±0.9	±1.9	±0.2		
IQ		100.5		104.8	108	103.5
Standard Deviation		±15.8		±14.7	±14	±17.7

IQ was not lower in the community with optimal level of fluoride in drinking water in China.

Appetitive-based learning in rats: Lack of effect of chronic exposure to fluoride

Gary M. Whitford^{a,*}, Jennifer L. Whitford^b, Stephen H. Hobbs^b

^a Department of Oral Biology, Medical College of Georgia, Augusta, GA 30912-1129, United States

^b Department of Psychology, Augusta State University, Augusta, GA 30904, United States

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ABSTRACT

Background: Chronic ingestion of optimally fluoridated water (ca. 1.0 mg/L) has not been associated with any adverse health effects. Possible effects on the nervous system, however, have received little attention. One study with rats given high doses of fluoride reported subtle behavioral changes. The authors suggested that the ability of humans to learn might be reduced and recommended further study with humans and rats. The present study was done to provide data with which to assess this suggestion.

Methods: Weanling, female rats ($n = 32$) were provided with water containing graded doses of fluoride (0, 2.9, 5.7, 11.5 mg/kg body weight/day) for eight months. While under restricted food access they were tested for their ability to learn an operant response for food and to adjust their responding under schedules of reinforcement requiring high rates of responding (5 days) and then low rates of responding (10 days). Bone, plasma and seven regions of brain were analyzed for fluoride.

Results: There were no significant differences among the groups in learning or performance of the operant tasks. Tissue fluoride concentrations were directly related to the levels of exposure. In the 11.5 mg/kg/day group the bone, plasma and brain concentrations were 99, 305 and 221 times higher, respectively, than those in the control group. The average brain-to-plasma fluoride concentration ratios in each of the seven brain sections fell within a narrow range and did not exceed 0.40. There was no consistent evidence for the preferential uptake of fluoride by any given brain section.

Conclusion: Chronic ingestion of fluoride at levels up to 230 times more than that experienced by humans whose main source of fluoride is fluoridated water had no significant effect on appetitive-based learning.

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J. Neurotoxicology and Teratology. 2009.

Conclusion: Chronic ingestion of fluoride at levels up to 230 times more than that experienced by humans whose main source of fluoride is fluoridated water had no significant effect on appetitive-based learning.

IQ and Harvard's review

29

“Harvard University scientists say that Wichita voters shouldn't depend on a research study they compiled to decide whether to put fluoride in the city's drinking water to fight tooth decay.

While the studies the Harvard team reviewed did indicate that very high levels of fluoride could be linked to lower IQs among schoolchildren, the data is not particularly applicable here because it came from foreign sources where fluoride levels are multiple times higher than they are in American tap water.”

Witchita Eagle

Read more here: <http://www.kansas.com/2012/09/11/2485561/harvard-scientists-data-on-fluoride.html#storylink=cpy>

Support for fluoridation

30



March 22, 2013

Dr. Myron Allukian, Jr.
Immediate Past President, American Association for Community Dental Programs
Associate Clinical Professor, Harvard School of Dental Medicine
Via email: myalluk@aol.com

Dear Dr. Allukian:

As Deans of Harvard Medical School, Harvard School of Dental Medicine and the Harvard School of Public Health, we continue to support community water fluoridation as an effective and safe public health measure for people of all ages.

Numerous reputable studies over the years have consistently demonstrated that community water fluoridation is safe, effective, and practical. Fluoridation has made an enormous impact on improving the oral health of the American people.

Our country is fortunate to have over 204 million Americans living in fluoridated communities and having access to the health and economic benefits of this vital public health measure.

Claim: “We should discontinue fluoridation because 40% of children in the US have dental fluorosis.”

The association between enamel fluorosis and dental caries in U.S. schoolchildren

Hiroko Iida, DDS, MPH; Jayanth V. Kumar, DDS, MPH

Conclusion. This study’s findings suggest that molars with fluorosis are more resistant to caries than are molars without fluorosis.

Clinical Implications. The results highlight the need for those considering policies regarding reduction in fluoride exposure to take into consideration the caries-preventive benefits associated with milder forms of enamel fluorosis.

JADA 2009;140(7):855-862.

Resources

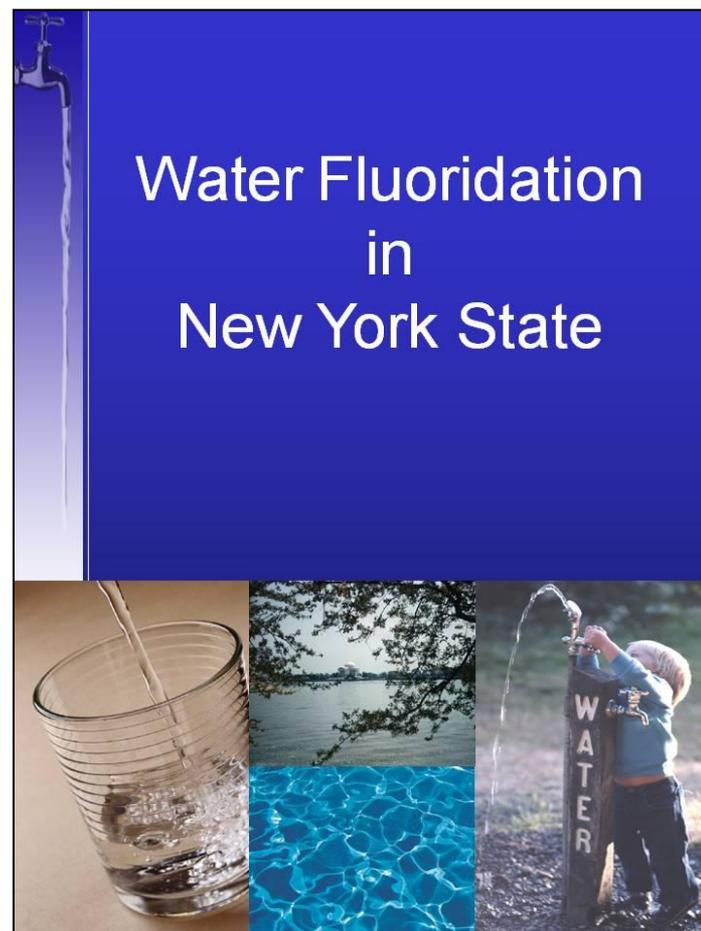
32

- New York State Department of Health (NYSDOH) website
 - CDC and ADA
- Technical Assistance Center in Rochester
 - ILikeMyTeeth.org - NewYork.ILikeMyTeeth.org
 - FluorideScience.org
- Rural Water Association
- Local Health Department
 - Water Fluoridation Manual

Fluoridation Manual

33

- Addresses
 - Benefits
 - Safety concerns
 - Cost
 - Operations and Engineering
- Contains:
 - Articles
 - Fact sheets and official statements
 - New York specific information



New York.ILikeMyTeeth.org

34

- Component website on ILMT
- Features information specific to NYS including:
 - NYS laws and regulations
 - Electronic copy of fluoridation manual
 - New York fluoridation maps
 - Links to other fluoridation websites
- Fact sheets and resources

New York State
FOR ORAL HEALTH

ABOUT US NEWS EVENTS RESOURCES VIDEOS

Log In

I NY

what's needed?

- Fluoridation
- Access
- Education

life is better WITH TEETH

Communities across America are getting smart and demanding better oral care — for themselves and their kids. Get the facts today.

LEARN MORE

fluoride SCIENCE

Find the official policy statements and consumer information on fluoride. Learn about its health effects and its history.

LEARN MORE

Our Challenge: Reduce Tooth Decay

Fifty years ago, most people faced their golden years without any teeth at all. Today, we keep most of our teeth for a lifetime. We've come a long way, but there's still a lot of work to be done, especially in poor communities — and particularly among children. The good news is that there are easy solutions to ensure a healthy mouth and strong teeth.

How Fluoride Works

From your faucet, to your water glass, to your mouth... How does fluoride work to make your teeth healthy and strong? Check out this video to find out.

See How Our State Ranks

A report from
The Pew Center on the States

JOIN US

Want to know more? We'll put you on our email list.

Your Email:

SIGN UP

Upcoming Events

ALL EVENTS

News & Reports

05/08/2012
1 in 5 Have Untreated Cavities, Race and Income Matter - Fluoridation is Key

05/17/2012
Health Commissioner Supports Water Fluoridation

READ MORE

SPREAD THE WORD:

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Site Map | Privacy Policy | Terms of Use

- Topic summaries
- Critical appraisals
- Videos featuring fluoride researchers

The screenshot shows the FluorideScience.org website. At the top left is the logo for "fluoride SCIENCE" with the tagline "BROUGHT TO YOU BY THE CENTER FOR FLUORIDE RESEARCH ANALYSIS". A navigation menu includes "HOME", "ABOUT US", "WHY WE'RE DOING THIS", "RESOURCES", and "CONTACT US".

The main content area features a purple "CHECK THE FACTS" search box. It includes a "TOPIC:" dropdown menu, a "RESEARCH REVIEWS" section, and search filters for "RESEARCH BY AUTHOR", "RESEARCH BY TITLE", "RESEARCH BY YEAR", and "RESEARCH BY TOPIC".

To the right of the search box is a large white box with the text "FLUORIDATION: What the Science Really Says".

Below the search box, there are two columns of content. The left column is titled "Infant Formula & Fluoridated Water" and features a video player showing Dr. Gary M. Whitford, PhD, DMD. The right column is titled "Recent Reviews" and contains a summary of a study titled "An assessment of bone fluoride and osteosarcoma".

At the bottom of the page, there is a logo for the "AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTRY" and a "SPREAD THE WORD:" section with a copyright notice: "© 2012 Fluoride Science | Site Map | Privacy Policy | Terms of Use".

Claim: *There are better ways to deliver fluoride*

36

- The National Preventive Dentistry Demonstration Program found community water fluoridation (CWF) to be the most effective in terms of cost and outcomes
- Strong support from economic analysis
- CWF benefits all, regardless of SES, dental insurance coverage and access to dental care
- Even with fluoridated toothpaste, areas with CWF show lower rates of tooth decay

Alternatives have Limitations: Impact of a Magic Pill

37

Issues	Factors	Estimate (%)	Impact (%)
Efficacy	Pill reduces cavities in permanent dentition by 50%	50	50
Adoption	90% of clinics and physicians write prescriptions	90	45
Reach	90% of parents buy prescriptions	90	41
Implementation	90% of children take the pill every day	90	36
Maintenance	80% of children engage in this behavior on a long term basis	80	29

Source: Adapted from Lawrence Green, CDC Workshop, October 2007.

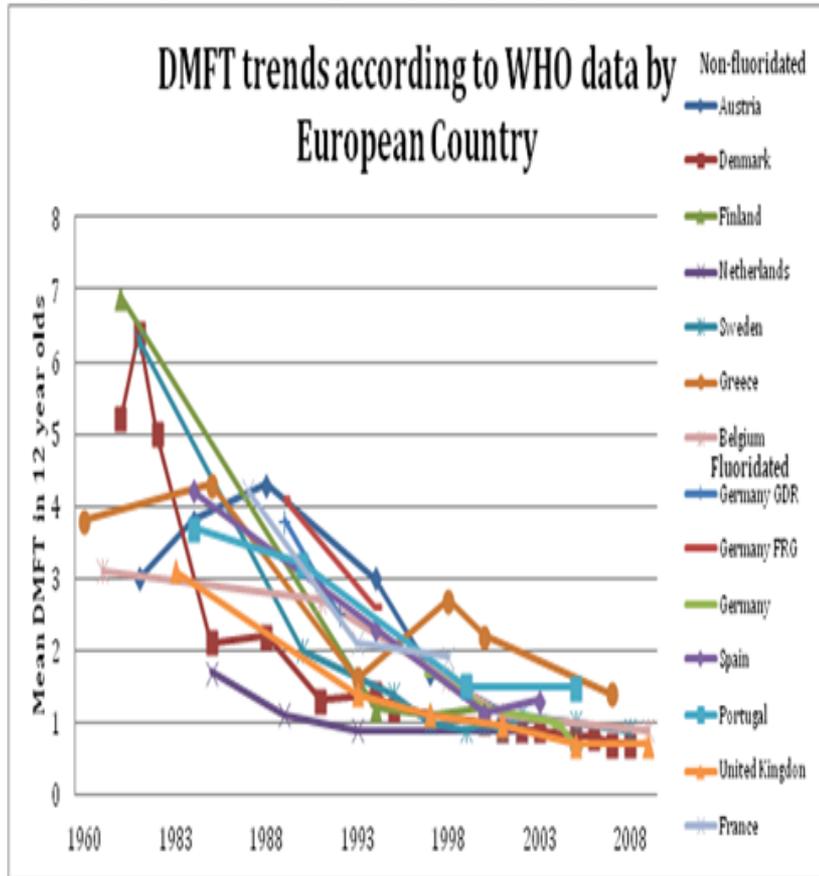
Claim: *Most countries in Western Europe don't fluoridate, so why do we?*

38

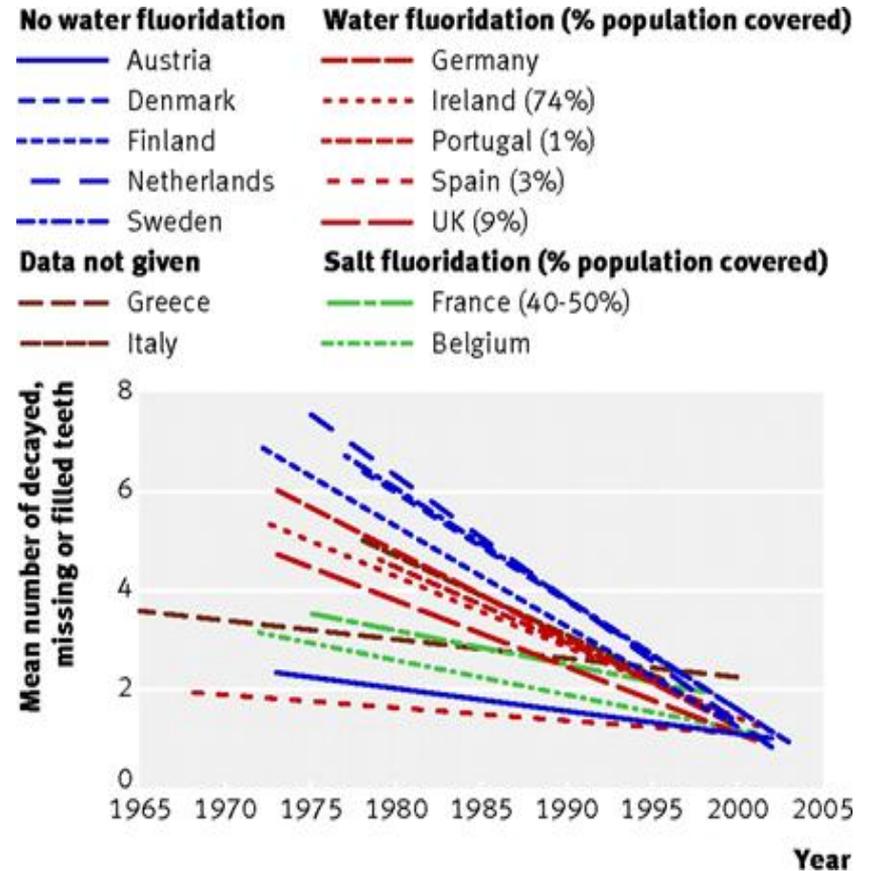
- The U.K., Spain, and Ireland have fluoridated water
- In some parts of western Europe, large number of water systems make CWF logistically challenging, so they practice salt fluoridation instead
- 405 million people in 60 countries drink fluoridated water

Fluoride in Drinking Water and Tooth Decay in Europe

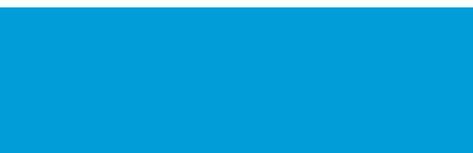
Data from WHO Database*



Data manipulated to show linear trend



Source: Adding fluoride to water supplies. K K Cheng, Iain Chalmers and Trevor A Sheldon. BMJ 2007;335:699-702



Claim: *Fluoridation causes serious health problems such as cancer*

41

- National Cancer Institute, National Research Council, FDA, California EPA OEHHA Committee
 - No convincing evidence of causal link between fluoridation/fluoride and cancer
- CDC
 - “No persuasive evidence” that CWF poses harmful health effects
- At least 100 million Americans have been drinking fluoridated water for decades without developing health issues.
- In India and China alone – over 200 million people are exposed to very high levels of fluoride where skeletal fluorosis is common but not osteosarcoma.

Claim: *“The National Kidney Foundation withdrew its support of water fluoridation”*

42

FACT: "The NKF has no position on fluoridation of water. "

- Dietary advice for patients with CKD should primarily focus on established recommendations for sodium, potassium, calcium, phosphorus, energy/calorie, protein, fat, and carbohydrate intake. Fluoride intake is a secondary concern.
- There is no consistent evidence that the retention of fluoride in people with these stages of CKD (stages 4 & 5) who consume optimally fluoridated drinking water results in any negative health consequences.

Claim: *“The ADA warns parents not to add fluoridated water to infant formula because of its harmful effects”*

43

FACT: ADA recommendations -

- Continue use of liquid or powdered concentrate infant formulas reconstituted with optimally fluoridated drinking water while being cognizant of the potential risk for enamel fluorosis.
- Use ready-to-feed formula or liquid or powdered concentrate formula reconstituted with water that is either fluoride-free or has low concentrations of fluoride when the potential risk for enamel fluorosis is a concern.

http://ebd.ada.org/contentdocs/ADA_Evidence-based_Infant_Formula_Chairside_Guide.pdf

Claim: “Fluoride works primarily topically, not systemically”

44

FACT: Studies show fluoride works via both topical and systemic effects. There is a pre-eruptive caries preventive effect and continuous exposure to small amounts of fluoride is the best for remineralization of tooth enamel (benefits both adults and children).

“The findings indicated that preeruption exposure was required for a caries-preventive effect and that exposure after eruption alone did not lower caries levels significantly. However, the maximum caries-preventive effects of fluoridated water were achieved by high pre- and posteruption exposure.”

Singh KA, Spencer AJ, Armfield JM. Relative Effects of Pre- and Posteruption Water Fluoride on Caries Experience of Permanent First Molars. J Public Health Dent. 2003;63(1):11 – 19.

Claim: *"Fluoridated water contains 250 x more fluoride than mother's milk."*

45

FACT:

- There is no known adverse health effect for infants. Milder form of dental fluorosis is the only risk.
- Vitamin D is added to milk because mother's milk lacks sufficient amounts. The National Academy of Sciences and the American Academy of Pediatrics recommends vitamin D per day beginning during the first 2 months of life.

http://www.nyhealth.gov/prevention/dental/fluoride_guidance_during_infancy.htm

New Guidelines for Vitamin D Intake, Pediatrics Vol. 111 No 4 April 2003.

Claim: *Fluoride is an additive, equivalent to forcing people to take medicine*

46

- Fluoridation
 - the adjustment of *natural* water fluoride levels to bring to optimum
- Fortification is a common practice - Folic acid, Vitamin D, Iodine etc.
- U.S. courts have rejected the idea that fluoride is a medication and should not be allowed in water supply.

Claim: *Cannot manage fluoride intake*

47

- There is no need to control water intake. Fluoride from dental products need to be used appropriately.
- There is a history of 65 years of safety record.
- NRC report showed that there is a population threshold for severe enamel fluorosis below 2 mg/L.
- EPA's analysis provides that the proposed recommendation of 0.7 mg/L of F⁻ will protect against any potential adverse health effects.

Claim: “FSA is not acceptable because it adds dangerous impurities like arsenic and lead to water supply.”

48

FACT:

- To ensure the public's safety, all additives used at a water treatment facility must meet strict quality standards. American Water Works Association (AWWA) and the NSF/ANSI (National Sanitation Foundation/American National Standards Institute) measure levels of impurities.
- The average concentration of arsenic and lead from all samples of water fluoridated with FSA, tested by NSF International from 1992 to 2000 was less than 0.1 ppb (parts per billion)

Training

49

- New York Rural Water Association (NYRWA)
 - Operations and Engineering
 - Benefits
 - Safety concerns
 - Technical Assistance

Claim: “*Communities are putting an end to fluoridation..*”

50

FACT:

- In 2010, 73.9% of the U.S. population on community water systems, or about 204.3 million people, had access to fluoridated water.
- The percent of the U.S. population on community water systems increased from 69.2% in 2006 to 73.9% in 2010.
- In New York State over 12.9 million people receive fluoridated water.

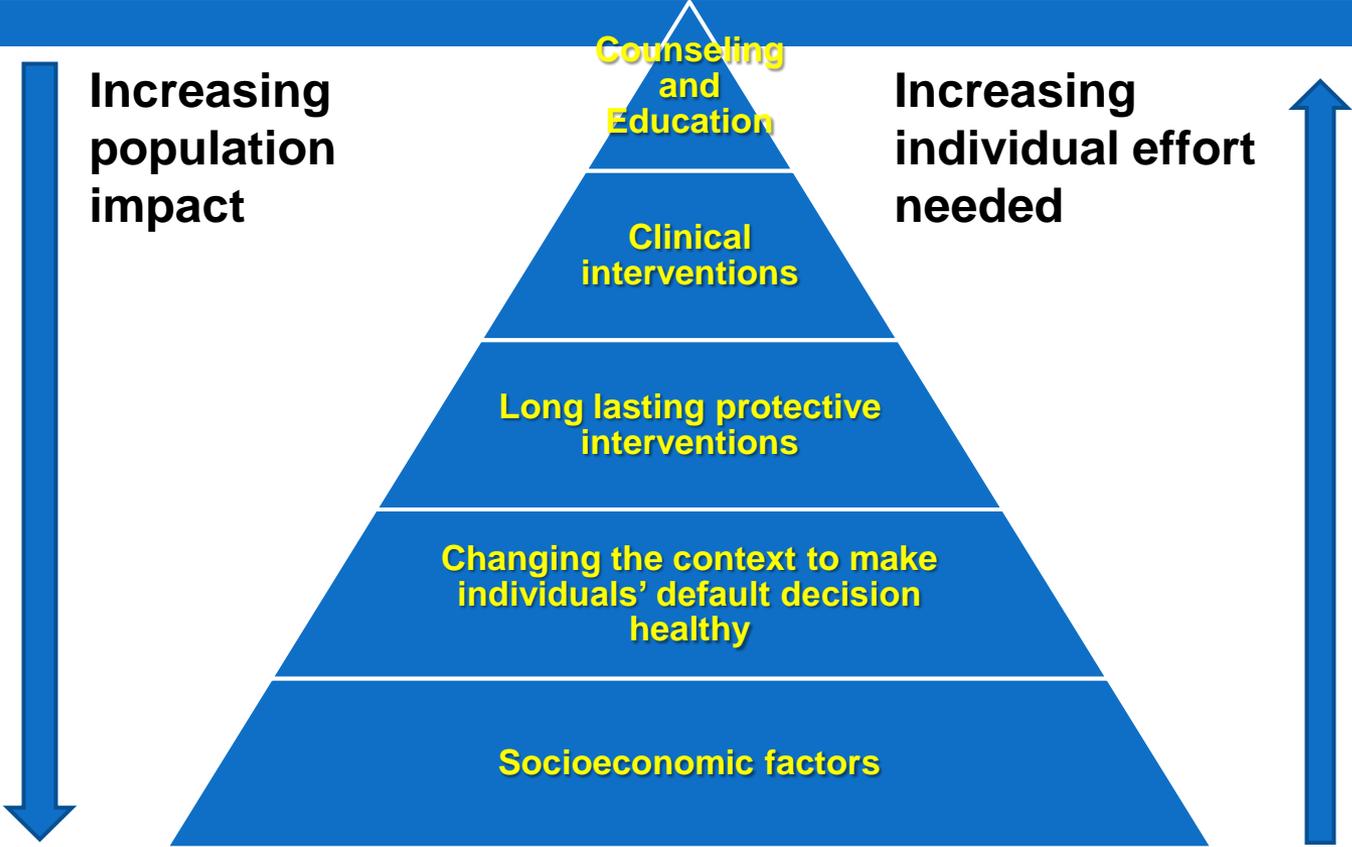
Data Source: <http://www.cdc.gov/fluoridation/statistics.htm>

What is the Alternative?

51

- Evidence of benefits and risks
- Effectiveness and cost effectiveness
- Return on investment
- Reach and impact

New York State's Health Improvement Plan



THE COMMUNITY GUIDE
Community Water Fluoridation

Recommended

Summary

- Water fluoridation
 - ▣ benefits all members of the community, regardless of age, race, SES, access to dental care
 - ▣ offers a great return on its investment
 - ▣ is recommended by the Task Force on Community Preventive Services and all major health organizations
- “Fluoridation is the single most important commitment a community can make to the oral health of its children and to future generations.”
 - Surgeon General C. Everett Koop

Thank You

Paul J. Michaelson, D.D.S., F.A.C.P.
Diplomate of the American Board of Prosthodontics
825 Washington Street
Watertown, New York 13601
315.785.5427



May 28, 2012

Jeffrey E. Graham, Mayor
245 Washington Street, Room 302A
Watertown, New York 13601

Dear Mayor Graham :

As a resident of the City of Watertown and a healthcare practitioner I would like to comment on the fluoridation issue being considered by the City Council. I have practiced dentistry in Watertown for almost 36 years. During that time I have seen patients of all ages though the emphasis of my practice has been on my specialty of prosthodontics. Prosthodontics is the specialty in dentistry which addresses the complex needs of people who have lost many teeth or whose teeth require restoration beyond the ordinary.

One important conclusion I have come to embrace in my years of practice is that the early health of patients' teeth is a determinant of whether they will be able to keep their teeth for a lifetime and of how much treatment they will need during that lifetime.

Ingestion of fluoride during the window of opportunity during childhood from about age one to age twelve is an important factor. Topically applied fluoride (as in toothpastes and mouth rinses) is not as effective as ingested fluoride since it does not help make the whole tooth less susceptible to decay but only the outside layer of enamel and then only temporarily.

The suggestion that fluorosis is a problem has not been borne out by my experience. I cannot remember a single case of it which required intervention. There are a lot of other causes of developmental discoloration which are somewhat common such as that caused by tetracycline and some childhood illnesses.

Please do not let the future dental health of your children and grandchildren be jeopardized by a case presented to you based on selective misinterpretations. The reality of dental health observations and a strong body of peer reviewed literature over many years of use of fluoride regulation in our water supply certainly seem to justify continuation of this practice.

Thank you for the opportunity to provide input into your decision making process. I would be glad to answer further questions should you have them.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Paul J. Michaelson", with a long horizontal flourish extending to the right.

Paul J. Michaelson, D.D.S., F.A.C.P.

MAY 31 2013

May 30, 2013

To: Watertown City Council

Dear Mayor Graham and Council Members: Mrs. Burns, Mr. Butler, Mrs. Macaluso, and Mr. Smith:

I am a Watertown City resident employed by North Country Children's Clinic where I have been a clinical dental hygienist and dental program administrator for nearly 20 years. I am reading with concern the public attacks that a small group has brought regarding the well researched benefits of water fluoridation by such credible agencies as the Center for Disease Control, National Institute of Health, American Public Health Association and numerous state departments of health including the NYS Department of Health.

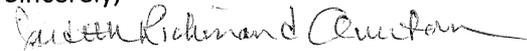
Prior to my return to NNY in 1991, I spent years in clinical dentistry working for Tufts and University of Connecticut Dental Schools and in private dental practices in Boston area communities, like Watertown, whose residents had access to fluoridated water supplies. Those patients, in general, had a low incidence of dental caries(cavities) nor did I ever see a case of dental fluorosis among the many children and adults in those private dental practices.

During my 19 years of clinical and administrative work at North Country Children's Clinic I have had the opportunity in our South Jefferson Schoolbased and Lowville Community and Schoolbased Dental Clinics to observe firsthand the dramatic oral disease evident in children and adults not having the benefit of fluoridated water. North Country Children's Clinic is the only dental program in Jefferson/Lewis Counties which will provide dental care for those on public insurance, including Medicaid, or those without dental insurance who are unable to pay for these services. Our dentists and hygienists on a daily basis see people with acute dental problems such as abscessed teeth, pain, inflammation, infection, which can result in cellulitis, a life threatening condition, and who are unable to find care due to inability to pay.

Community water fluoridation benefits everyone, even those who do not have the financial means to purchase fluoride supplements or to have regular dental care. Please consider those members of our community in your decision regarding the continuance of water fluoridation in City of Watertown.

Thank you for your commitment to our community.

Sincerely,



Judith Richmond Overton, RDH, BS, Dental Director, North Country Children's Clinic, Inc.
128 TenEyck Street, Watertown, New York

Member: American Dental Hygienists Association, State of New York Dental Hygienists Association, New York State Oral Health Coalition, New York State Dental Association's Steering Committee on Public Health and Access to Care, Ft. Drum Regional Health Planning Organization Quality Promotion & Community Engagement Committee, Jefferson HeadStart Advisory Committee, Lewis County HeadStart Advisory Committee

Giso, Elaine

From: Saunders, Ann
Sent: Wednesday, June 05, 2013 2:31 PM
To: Giso, Elaine
Subject: FW: Dr. J Kumar and Fluoridation

FYI

Ann M. Saunders
City Clerk
City of Watertown NY
245 Washington St
Watertown NY 13601
(315) 785-7780
asaunders@watertown-ny.gov

From: Carol S. Kopf [mailto:ckopf2@optonline.net]
Sent: Sunday, June 02, 2013 7:51 AM
To: Addison, Sharon; Burns, Roxanne; Butler, Joseph; Macaluso, Teresa R; Graham, Jeff; Smith, Jeff; Saunders, Ann
Cc: Sligar, Michael
Subject: Dr. J Kumar and Fluoridation

To Watertown Officials

I understand Dr. J. Kumar of the NYS Dep't of Health will be speaking before you regarding water fluoridation. Dr. Kumar has published many studies concerning fluoride. There's a lot of data within Dr. Kumar's own research that doesn't support fluoridation that I won't assume he will share with you.

A 2009 Journal of the American Dental Association study by Kumar actually shows no benefit from fluoridation.

Attempting to prove that fluorosed teeth have fewer cavities, Kumar uses 1986-1987 National Institute of Dental Research (NIDR) data which, upon analysis, shows that 7- to 17-year-olds have similar cavity rates in their permanent teeth whether their water supply is fluoridated or not (Table 1).

Kathleen Thiessen, PhD, SENES Oak Ridge, Inc., Center for Risk Analysis, using Kumar's statistics, illustrates fluoridation's lack of effectiveness on page 5 of a paper submitted to Health Canada in 2009 (<http://www.fairbanksalaska.us/wp-content/uploads/2011/07/20091127Thiessen-Comments-on-Canada-Fed-Prov-Terr-Comm-on-Drinking-Water-Health.pdf>)

Kumar divided children into four groups based on their community's water fluoride levels:

Less than 0.3 mg/L where 55.5% had cavities
From 0.3 to 0.7 mg/L where 54.6% had cavities
Optimal 0.7 to 1.2 mg/L where 54.4% had cavities
Over 1.2 mg/L where 56.4% had cavities

Another Kumar research paper published in the February 1998 *New York State Dental Journal*

(Figure 1, Page 41, "Recommendations for Fluoride Use in children") shows that after over 50 years of water fluoridation, children in Newburgh, New York have more cavities and more fluoride-caused discolored teeth (dental fluorosis) than children in never-fluoridated Kingston, New York.

Because the National Research Council's 2006 Fluoride Panel, which Kumar was a member of, reported that babies can be fluoride-overdosed from consuming infant formula made with fluoridated water, the American Dental Association sent out an e-gram in November 2006 to its members and supporters alerting them to this new discovery. Following the ADA's advice, many other government, health and dental groups gave the same caution. (See <http://www.FormulaFluoride.webs.com>).

Kumar hinted at need for this precaution in the May 1989 American Journal of Public Health. He writes, "Studies of fluoride levels of baby formulas and cereals have shown a significant increase in the fluoride content when fluoridated water was used for processing these foods"

New Hampshire state-law requires warnings on yearly water reports to residents that, if they want to avoid dental fluorosis in their children's teeth, they shouldn't routinely feed them infant formula made with fluoridated water. But Kumar and the NYS Dep't of Health's dental bureau fails to effectively get this information to New Yorkers.

Buried on a NYS Dept of Health webpage is this caveat: "Parents who are concerned about the risk of enamel fluorosis, can mix liquid concentrate or powdered infant formula with water that is fluoride free or contains low levels of fluoride. Examples are water that is labeled purified, demineralized, deionized, distilled or reverse osmosis filtered water."

A Kumar study in the January 2012 Journal of the American Dental Association shows that despite decades of water fluoridation in New York State reaching 72% of the population, hospital emergency room treatment for NYS toddlers' severe tooth decay has grown substantially in numbers and costs. Many kids required general anesthesia before treatment.

Kumar reports that 25,622 children, under six-years-old, made cavity-related emergency dental visits from 2004 through 2008. Visits grew from 4,361 in 2004 to 5,683 in 2008. Seventy-five percent required general anesthesia, up from 35% in 2004. Total costs: \$121 Million (\$18.5 million in 2004 increased to \$31.3 million in 2008), most borne by taxpayers.

The reason: "There is a limited number of dentists willing to treat patients younger than 6 and/or accept Medicaid," write Kumar et al.

More Statistics Show Fluoridation Fails New York State

NYS Department of Health statistics reveal that, even when water is fluoridated, cavity-rates are extremely high in low-income third-graders. For example: (2002-2004 statistics) Oral Health Data at <http://www.health.ny.gov/statistics/chac/chai/>

- 85% of low-income third graders have tooth decay in Wayne County (74% fluoridated)
- 83% in Ontario County (61% fluoridated)
- 82% in Cayuga County (not fluoridated)
- 82% in Allegheny County (14% fluoridated)
- 81% in Livingston County (55% fluoridated)
- 67% in Schuyler County (not fluoridated)
- 58% in Nassau County (not fluoridated)

Further, in 1990, the NYS DoFH published a study, "Fluoride: Benefits and Risks of Exposure," alerting officials that fluoride can be harmful to kidney patients, diabetics and those with fluoride hypersensitivity even at "optimal" levels. The study's authors advised that more research was needed before fluoridation can be deemed safe. However, that research has never been conducted. (<http://cro.sagepub.com/content/1/4/261.full.pdf+html>)

New York State communities which have already stopped or rejected fluoridation include: Suffolk, Nassau & Rockland counties, Albany, Elba, Naples, Levittown, Canton, Corning, Johnstown, Oneida, Carle Place, Beacon, Poughkeepsie, Riverhead, Central Bridge Water District, Homer, Ithaca, Rouses Point, Pulaski, Romulus and Amsterdam.

Dr. Kumar works very closely with the dentists' union, the American Dental Association, on fluoridation issues.

Respectfully submitted,

Carol S. Kopf, BS, MA
104 Meridian Road
Levittown, New York 11756

Giso, Elaine

From: Sligar, Michael
Sent: Wednesday, June 05, 2013 3:41 PM
To: Addison, Sharon
Cc: Giso, Elaine
Subject: FW: Topic Summaries and Other Resources
Attachments: toothpaste.pdf; BoneCancerOsteosarcoma.pdf; enamel fluorosis.pdf; InfantFormula.pdf; IntelligenceQuotient.pdf; KidneyHealth.pdf; ToothDecay.pdf; What_Opponents_Say__March_2012_[1].pdf; 125-5_Kumar.pdf; benefits.pdf; cost.pdf; Fluoride-Myths-Facts_12-02-11.pdf; Harvard_Longwood_Response_to_Fluoridation.pdf; HHS news release.pdf; QandAonCommunityWaterFluoridation_v1b[1].pdf; safety.pdf; Surgeons-General-CWF.pdf; technical.pdf; training.pdf; RespectedOrgs-noPics_v2a.pdf; Is water fluoridation still necessary.pdf

Sharon,

There's a lot here. I haven't had a chance to review all this.

Michael J. Sligar, Superintendent
Department of Water
City Municipal Building
245 Washington Street, Suite 202
Watertown, New York 13601

Phone: (315) 785-7757

Fax: (315) 785-7738

Email: MSligar@watertown-ny.gov

From: Erin Knoerl [<mailto:exk08@health.ny.gov>]
Sent: Wednesday, June 05, 2013 12:13 PM
To: Sligar, Michael
Cc: Kumar, Jayanath; John A Helmeset; William M Gilday
Subject: FW: Topic Summaries and Other Resources

Mr. Slinger,

Attached are multiple documents the Department of Health would like to share with the Watertown City Council, Mayor, and yourself on the topic of community water fluoridation. Could you please disseminate to the Mayor and the Council members prior to the June 10, 2013 meeting?

Please let me know if you have any questions or if there is a topic you or any of the Council members would like additional information on.

Thank you,
Erin

Erin Knoerl, MPH
Public Health Specialist III
Bureau of Dental Health
Empire State Plaza
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www.health.ny.gov/prevention/dental



TOOTHPASTE

CENTER FOR FLUORIDE RESEARCH ANALYSIS

TOOTHPASTE

The use of toothpaste during tooth brushing is a practice that dates back centuries. However, the ingredients used in toothpaste have evolved over time. The addition of fluoride to toothpaste began to be commonplace in the U.S. in the 1970s, and by the 1990s, fluoride toothpaste accounted for more than 90% of the market in the United States and other developed countries.

Based on the results of more than 50 years of research which included randomized controlled trials, the routine use of fluoride toothpaste as a safe and effective means to reduce tooth decay has been recognized by national and international health organizations. These include the American Dental Association, the American Academy of Pediatrics, the American Academy of Pediatric Dentistry, the Canadian Dental Association, the Centers for Disease Control and Prevention, and the World Health Organization.

Fluoride toothpaste has been partly credited for the significant reduction in the prevalence of dental decay within the past several decades. Authors of systematic reviews of research data concluded that children age 5 to 16 years who used a fluoridated toothpaste regularly had fewer decayed, missing, and filled permanent teeth after 3 years(1-2). When

toothpaste was used twice a day, the benefit increased.

The active ingredient in the U.S. for most fluoride toothpaste is sodium fluoride, at a concentration of 1000 to 1100 parts per million (ppm), which is equivalent to 1000 to 1100 milligrams per liter (mg/L). The only potential adverse effect associated with fluoride toothpaste is enamel fluorosis, a mild cosmetic effect that results in slight white speckling of the teeth. This occurs when an average of more than 0.05 mg/kg of body weight per day of fluoride is ingested.

Benefits from fluoride toothpastes should not be interpreted as reason to devalue the importance of community fluoridation efforts
- Marthaler (2002)

RECOMMENDATIONS

What to Use When Brushing

- For children:
 - When teeth first begin to erupt, parents should brush their child's teeth twice daily with water and an age-appropriate soft toothbrush.
 - Beginning at the age of two, children may brush their teeth with a pea-sized amount of fluoride toothpaste, under parental supervision, ensure that toothpaste is not swallowed. If a child were believed to be at a high risk for caries, a dentist may advise the use of fluoridated toothpaste before two years of age.
- For adults:
 - Brush at least twice a day with fluoridated toothpaste using a soft toothbrush.

- (1) Marinho VCC, Higgins JPT, Logan S, Sheiham A. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database of Syst Rev.* 2003;1:CD002278.
- (2) Twetman S *et al.* Caries preventive effect of fluoride toothpaste: a systematic review. *Acta Odontol Scand.* 2003;61(6):347-55.

SUMMARY OF RELEVANT ARTICLES

Marinho VCC, Higgins JPT, Logan S, Sheiham A. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database of Syst Rev.* 2003;1:CD002278.

This systematic review considered the results of randomized or quasi-randomized controlled trials of fluoride toothpaste use in children up to the age of 16 for a period of at least one year. Outcomes from blinded assessments were compared against those from placebo groups. Seventy-four studies were evaluated, seventy of which were included in a meta-analysis that encompassed over 42,000 children. Based on their analysis, the authors made the following conclusions:

- Over 50 years of research clearly indicates that fluoride toothpastes are efficacious in preventing caries.
- Children who brush their teeth at least once daily with fluoride toothpastes will experience less decay, and brushing twice a day increases the benefit.
- The benefit from brushing with fluoride toothpastes may be greater in those children with higher baseline levels of decayed and missing teeth /or filled surfaces.

There was insufficient evidence to conclude whether children age 5 to 16 are at a greater risk for fluorosis due to brushing with fluoride toothpastes.

Twetman S *et al.* Caries preventive effect of fluoride toothpaste: a systematic review. *Acta Odontol Scand.* 2003;61(6):347-55.

This systematic review focused on the effects of fluoride toothpaste to prevent caries in a range of age groups. Furthermore, the review examined whether fluoride concentration and supervised brushing might have an impact on outcomes. The review considered articles published between 1996 and April 2003. The studies evaluated were randomized or controlled clinical trials with a minimum follow-up of at least 2 years. The endpoint examined was a change in the decayed, missing, or filled teeth or surfaces (DMFT/S) levels in either the permanent or deciduous dentition. Given the inclusion criteria, 54 articles were ultimately considered. The authors made the following conclusions based on their findings:

- There is strong evidence to indicate the preventive effect of fluoride toothpaste against caries in the permanent dentition of young children when compared to the use of a placebo toothpaste.
- Evidence suggests the presence of a dose-response relationship between the concentration of fluoride in toothpaste and increased caries resistance. Toothpaste with greater concentrations of fluoride (1500 ppm) compared to standard fluoride concentrations (1000 ppm) had a greater preventive effect in the permanent dentition of young children.
- Evidence also suggests that there is a greater preventive effect of the use of fluoridated toothpaste when brushing is supervised in children up to age 15.
- Inconclusive evidence exists to demonstrate the preventive effect of fluoride toothpaste against caries in primary dentition.

Marthaler TM. Dentistry between pathology and cosmetics. *Community Dent Oral Epidemiol.* 2002;30: 3-15.

This paper examined the use of fluoride in public health programs and its association with the observed decrease in caries prevalence. The author considered brushing with fluoride toothpaste alongside community fluoridation programs and concluded that, although fluoride toothpaste is effective against caries, it cannot be relied on as the sole mechanism for fluoride delivery. Fluoride toothpaste may be more successful in reducing decay rates in populations where personal hygiene standards are already fairly high. Furthermore, it is possible

that fluoride toothpaste and toothbrushes may not be readily accessible to everyone. Based on these findings, the author made the following determinations:

- Benefits from fluoride toothpastes should not be interpreted as a reason to devalue the importance of community fluoridation efforts.
- A very low prevalence of caries can be achieved “*when people consume fluoridated water and brush their teeth with fluoride toothpaste twice a day.*”

Clarkson JJ, McLoughlin J. Role of fluoride in oral health promotion. *Int Dent J.* 2000;50:119-28.

The authors examined different modes of fluoride delivery both at the individual and population levels, particularly after the introduction of community water fluoridation programs. After reviewing the evidence, the authors concluded that fluoride toothpaste is an acceptable means of fluoride delivery even in areas where water fluoridation programs exist. They suggest the need for further research on both the effectiveness of higher than standard concentrations of fluoride toothpaste in adults at a greater risk for caries, and lower than standard concentrations of fluoride toothpaste in young children. The authors made the following recommendations with regards to fluoride toothpaste:

- Fluoride concentration should be clearly indicated on fluoride containers.
- Toothpaste dispensers should be designed to limit the amount dispensed.
- Children should use toothpaste with adult supervision.
- Tooth brushing should be practiced twice a day.
- Tooth brushing should be followed by a gentle rinse to allow for the maximum topical benefit of fluoride.

Griffin SO, Regnier E, Griffin PM, Huntley J. Effectiveness of fluoride in preventing caries in adults. *J Dent Res.* 2007;86: 410-5.

The authors conducted a meta-analysis to determine the effectiveness of topically applied fluoride and water fluoridation in preventing/reversing caries among adults. Initially, 489 articles were identified, 50 of which were reviewed, and ultimately 20 studies were included in the final analysis. Of the twenty studies, ten were randomized clinical trials which examined the effectiveness of self-applied or clinically applied fluoride, and one was a split-mouth controlled trial. The split mouth study did not indicate whether treatment had been randomly assigned.

Among studies published after/during 1980, any fluoride (self- and professionally applied or water fluoridation) annually averted 0.29 (95%CI: 0.16-0.42) carious coronal and 0.22 (95%CI: 0.08-0.37) carious root surfaces. The prevented fraction for water fluoridation was 27% (95%CI: 19%-34%).

The authors also concluded that their findings suggested that fluoride prevented caries among adults of all ages, at a rate comparable for that seen in previous studies among children and youth. One finding of note was the consistency of the size of the effect for the various modes of fluoride delivery among adults, again, similar to the findings in children. Any mode of fluoride delivery among adults reduced caries by about 25%, similar to the prevented fraction seen for community water fluoridation. The data in previous studies for children using fluoride rinses showed a 26% prevention, while for toothpaste, there was a 24% reduction. Because older adults were more likely to retain their natural teeth than in previous generations, population-based efforts aimed at prevention of dental caries would become more important.

ADDITIONAL CREDIBLE ONLINE RESOURCES

Alliance for a Cavity-Free Future

<http://www.allianceforacavityfreefuture.org/en/us/home>

American Dental Association: Toothpaste.

<http://www.ada.org/1322.aspx>

Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. *MMWR*. 2001.

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm>

Centers for Disease Control and Prevention: Other fluoride products

<http://www.cdc.gov/fluoridation/other.htm#5>

FDI World Dental Federation

http://www.fdiworldental.org/c/document_library/get_file?uuid=e83a3c14-7a6b-4b48-99ac-d939b11fe9c3&groupid=10157

World Health Organization: Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach.

http://www.who.int/oral_health/publications/cdoe319to321/en/index.html

The Center for Fluoride Research Analysis is endorsed by the American Association of Public Health Dentistry and is dedicated to communicating the quality of fluoride-related studies.

For more information visit FluorideScience.org



BONE CANCER (OSTEOSARCOMA)

CENTER FOR FLUORIDE RESEARCH ANALYSIS

BONE CANCER (OSTEOSARCOMA)

The safety of the public water system is of paramount importance to health professionals and government agencies. In keeping with these fundamental principles, the potential for fluoride in drinking water to cause cancer has been carefully examined.

Concerns about cancer incidence increasing due to exposure to fluoride in drinking water have been raised and addressed periodically for many years. A study conducted by the U.S. National Cancer Institute in 1991 found no evidence of increasing trends in cancer risk (1). A systematic review conducted by the University of York, in the United Kingdom, found no clear association between water fluoridation and overall cancer incidence and mortality (2). Osteosarcoma, a form of bone cancer has become the focus of researchers because fluoride is known to accumulate in bone as well as in teeth.

According to the National Cancer Institute, the risk factors for osteosarcoma include past treatment with radiation therapy, treatment with anticancer drugs called alkylating agents, having a certain change in the retinoblastoma gene, and having certain conditions like Paget's disease (3).

In 2006, the National Research Council (NRC) conducted a comprehensive assessment of cancer risk arising from fluoride in drinking water (4). A summary of key points from the report are presented here because they frame the approaches for accessing cancer risk.

Difficulties of epidemiologic research identified in the NRC report:

- Cancer is not one disease endpoint. Cancers arise in different tissues and organ systems by different pathways. Risk factors for one type of cancer may not be risk factors for other types of cancers. To identify risk factors, research must be targeted for a specific type of cancer.
- Biologic pathways for some types of cancer often take up to as many as 10 years (or longer) before a diagnosis of cancer is made.

This makes it difficult to assess exposure to causal factors in human populations.

- Animal studies can yield information that help to focus hypotheses about risk factors for specific cancers in humans. However, there are limits to the generalizability of findings in animal studies for humans.
- Many cancers are rare and statistical inference is difficult when associations are weak.

Criteria used by NRC for evaluation of epidemiologic studies of cancer and fluoride include:

- Appropriate methodology.
- Potential for selection bias and information bias.
- Statistical power to detect real associations.
- Appropriate time windows for assessing exposures and potential effects.
- Control of potential confounders in the analysis.
- Sufficiently specific endpoints and adequate exposure estimation.
- Biologic plausibility of the association between fluoride and the cancer endpoint under investigation.

In addition, a process of weighing the body of evidence is important, since no single study will be flawless. The intent is to identify strengths and limitations of published studies and formulate a judgment concerning the likelihood that a causal link exists between fluoride and a cancer endpoint.

Taken together, the published studies do not make a strong case for fluoride to cause osteosarcoma or cancer in general.

Biological Plausibility of Osteosarcoma

The NRC report identified osteosarcoma, a form of bone cancer, as the cancer endpoint that met criteria for biologic plausibility. Biological plausibility is one component of a method of reasoning that provides an explanation for the underlying mechanism of the effect as fluoride in high doses has the ability to stimulate osteoblasts (4). In 1990, an animal study conducted as part of the National Toxicology Program (NTP) raised concern about the potential for fluoride to cause osteosarcoma (5). The findings from the NTP Study were determined to be 'equivocal' and indicated a need for further evaluation. A follow-up NTP study found no treatment-related increases at a higher dose of fluoride exposure (250 ppm) in male F344/N rats (6).

The NRC evaluated studies conducted before and after the 1990 NTP report. Overall, the NRC report identified some basis for the biologic plausibility of

fluoride affecting cell systems but no consistent evidence that fluoride is a risk factor for cancer incidence in humans (4).

The incidence of osteosarcoma is very low – approximately 400 cases are reported per year. If exposure to fluoride increases risk for osteosarcoma then there should be an increase in the incidence. This has not been observed.

Taken together, the published studies do not make a strong case for fluoride to cause osteosarcoma or cancer in general. Limitations in research design and the complexity of cancer biology make it difficult to be certain that no causal association exists. A margin of safety is evident, since low level fluoride exposure is prevalent and osteosarcoma remains a rare occurrence in the population.

- (1) Public Health Service. *Review of fluoride. Benefits and risks. Report of the ad hoc subcommittee on fluoride of the committee to coordinate environmental health and related programs.* Washington, DC: US Department of Health and Human Services; 1991.
- (2) McDonagh M, Whiting P, Bradley M *et al.* *A Systematic Review of Public Water Fluoridation.* York, UK: NHS Centre for Reviews and Dissemination, University of York; 2000.
- (3) National Cancer Institute. Bone cancer: questions and answers. Available from: <http://www.cancer.gov/cancertopics/factsheet/Sites-Types/bone>.
- (4) National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards.* Washington, DC: The National Academies Press; 2006.
- (5) National Toxicology Program. NTP toxicology and carcinogenesis studies of sodium fluoride (CAS No. 7681-49-4) in F344/N rats and B6C3F1 mice (drinking water studies). *Natl Toxicol Program Tech Rep Ser.* 1990;393:1-448.
- (6) National Toxicology Program. *NTP supplemental 2-year study of sodium fluoride in male F344 rats (CAS No. 7681-49-4).* National Toxicology Program, National Institutes of Health, Public Health Service, United States Department of Health and Human Services, Research Triangle Park, North Carolina.

SUMMARY OF RELEVANT ARTICLES

Kim FM, Hayes C, Williams PL *et al.* An assessment of bone fluoride and osteosarcoma. *J Dent Res.* 2011;90(10):1171-6.

The purpose of this study was to assess whether fluoride levels in bone were associated with osteosarcoma. A case-control design was used to compare bone fluoride levels in 137 subjects with primary osteosarcoma (cases) with 51 controls that had other malignant bone tumors. The median age of cases was 17.6 years old. The median age of controls was 41.3 years old. The gender distribution also differed with 53 percent of cases being male compared to 71 percent of controls. A subset of 32 cases was matched with controls based on gender and age. The study did not demonstrate an association between fluoride levels in bone and osteosarcoma. This was true even after adjusting for age and gender in the statistical analysis in the unmatched cases and controls.

The study provides assurance that fluoride exposure does not cause osteosarcoma. A limitation in the design is the small number of age-matched cases and controls. Since fluoride exposure over time may be related to

bone fluoride accumulation, older subjects would have higher bone fluoride levels than younger subjects. When the age distribution is widely different in the two groups, statistical methods may be unable to adequately control for this. The small number of age-gender-matched cases may lack statistical power to show a difference. Fluoride measured in bone at time of diagnosis may not reflect fluoride exposure during tumor initiation.

Levy M, Leclerc BS. Fluoride in drinking water and osteosarcoma incidence rates in the continental United States among children and adolescents. *Cancer Epidemiol.* 2012;36(2):e83-8.

The authors conducted an ecological analysis using the cumulative osteosarcoma incidence rate data from the CDC Wonder database for 1999–2006, categorized by age group, sex, and states. States were categorized as low (30%) or high (85%) according to the percentage of the population receiving community water fluoridation (CWF) between 1992 and 2006. There was no statistical difference in the incidence rates between low and high fluoridation states.

The authors failed to confirm higher incidence rates of osteosarcoma among males in the 5 to 14 year age group, although incidence rates for males in the 15–19 year age group were significantly higher than for females. Also, there was no evidence of “peaking” in male incidence rates or risk ratio between ages 5 and 8 as reported in Bassin’s study described below.

The authors concluded that the water fluoridation status in the continental U.S. has no influence on osteosarcoma incidence rates during childhood and adolescence.

Comber H, Deady S, Montgomery E, Gavin A. Drinking water fluoridation and osteosarcoma incidence on the island of Ireland. *Cancer Causes Control.* 2011;22:919–24.

The authors compared the incidence of osteosarcoma in Northern Ireland and the Republic of Ireland to examine if differences in incidence between the two regions could be related to their different drinking water fluoridation policies. While an estimated 70% of the population in the Republic of Ireland region receives fluoridated water, fluoridation is not implemented in Northern Ireland (NI). Data from the Northern Ireland Cancer Registry (NICR) and the National Cancer Registry of Ireland (NCRI) on osteosarcoma incidence in the respective populations were used to estimate the age standardized and age-specific incidence rates in areas with and without drinking water fluoridation. Osteosarcoma was rare and no significant differences were observed between fluoridated and non-fluoridated areas in either age-specific or age-standardized incidence rates of osteosarcoma. The authors concluded that this study did not support the hypothesis that osteosarcoma incidence in the island of Ireland is related to public water fluoridation.

Bassin EB, Wypij D, Davis RB, Mittleman MA. Age-specific fluoride exposure in drinking water and osteosarcoma (United States). *Cancer Causes Control.* 2006; 17:421–8.

The authors explored age-specific and gender-specific effects of fluoride levels in drinking water and the incidence of osteosarcoma using a matched case–control study design. The study was conducted in 11 hospitals in the United States and included a complete residential history for each patient and type of drinking water (public, private well, bottled) used at each address.

Their analysis, based on 103 cases under the age of 20 and 215 matched controls, showed an increased adjusted odds ratio for boys in the higher fluoride exposure group, reaching a peak of 5.46 (95% CI 1.50, 19.90) at age 7 years. This association was not apparent among girls.

The authors concluded that their exploratory analysis found an association between fluoride exposure in drinking water during childhood and the incidence of osteosarcoma among boys but not consistently among girls. The authors urged further research to confirm or refute this observation.

ADDITIONAL CREDIBLE RESOURCES

National Cancer Institute: Fluoridated water

<http://www.cancer.gov/cancertopics/factsheet/Risk/fluoridated-water>

American Cancer Society: Water fluoridation and cancer risk

<http://www.cancer.org/Cancer/CancerCauses/OtherCarcinogens/AtHome/water-fluoridation-and-cancer-risk>

The Center for Fluoride Research Analysis is endorsed by the American Association of Public Health Dentistry and is dedicated to communicating the quality of fluoride-related studies.

For more information visit FluorideScience.org

ENAMEL FLUOROSIS

Enamel fluorosis or dental fluorosis is a disturbance in mineralization of enamel caused by excessive ingestion of fluoride during the period of tooth development which is from birth to about eight years of age. Its manifestation ranges from very mild to severe based on how it appears on the tooth surface. The milder forms appear as barely noticeable fine lacy/white markings across the width of the tooth surface, while the severe form can range from heavily stained, pitted teeth to friable enamel. The severity of the condition is dependent on the dose, duration and timing of fluoride ingestion. The greater the dose and duration during the most critical period of tooth development, between the ages of about 15 and 30 months, the more severe the fluorosis. In its milder form, enamel fluorosis is considered a cosmetic effect and not an adverse functional effect.

Several previous reports had shown the efficacy and effectiveness of fluoride in preventing and controlling dental caries (1-4). It was for this reason that several modalities were implemented to increase fluoride intake at the individual and population level. The foremost of these modalities was the fluoridation of community water supplies which began in the United States in 1945. For several years it was the only additional source of fluoride apart from those occurring naturally in certain drinking water supplies and foods and beverages. Other modalities of fluoride delivery later included dietary fluoride supplements, fluoride toothpaste, various fluoride solutions, and professionally applied fluoride gel, foam, or varnish.

The increased availability of various sources of fluoride for children at the critical time of tooth development has resulted in an increase in the prevalence of enamel fluorosis since Dean's classic epidemiological studies in the 1930s (5). A national survey of the oral health of 6-19 year-old school children in the United States showed that the prevalence of fluorosis had increased from 23 percent in 1986-1987 to 41 percent in 1999-2004 (6). The increase in the prevalence of enamel fluorosis has been seen in both fluoridated and non-fluoridated communities; however, the greatest relative increase has occurred in non-fluoridated areas. During this time

there has also been a steep decrease in the caries experience among children aged 4 to 17 years in the United States of America.

The National Research Council, in its assessment of fluoride in drinking water, concluded that the prevalence of severe enamel fluorosis in the United States is extremely rare at fluoride concentrations below 2 mg/L (7). Therefore, adding fluoride to water to bring the level to an optimum level of 0.7 to 1.2 mg/L is unlikely to cause severe enamel fluorosis.

The risks of enamel fluorosis from the ingestion of fluoride must be weighed against the known benefit of fluoride to prevent caries. Studies show that teeth with fluorosis are more resistant to caries attack when compared to teeth without enamel fluorosis. The caries preventive effects of fluoride on teeth include increased resistance to acid attack, enhanced remineralization of demineralized enamel and alteration of pits and fissures, making them less susceptible to the cavity development process.

The author concluded by stating that water fluoridation and use of fluoride dentifrice are the most efficient and cost-effective ways to prevent dental caries

-Levy (2003)

- (1) Center for Disease Control and Prevention. MMWR Report: Recommendations for using fluoride to prevent and control dental caries in the United States. *MMWR Recomm Rep.* 2001;50(RR14):1-42.
- (2) Truman BI, Gooch BF, Sulemana IS, Gift HC, Horowitz AM, Evans CA, Griffin SO, Carande Kulis V, Harris KW. The Task Force on Community Preventive Services reviews of evidence regarding interventions to reduce dental caries, oral and pharyngeal cancers, and sports-related craniofacial injury. *Am J Prev Med.* 2002;23(18):21-54.
- (3) Marinho VC, Higgins JP, Logan S, Sheiham A. Topical fluoride (toothpastes, mouthrinses, gels or varnishes) for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2003;(4):CD002782.
- (4) Griffin SO, Regnier E, Griffin PM, Huntley VN. Effectiveness of fluoride in preventing caries in adults. *Journal of Dental Research* 2007;86(5):410-414.
- (5) Dean HT. Classification of mottled enamel diagnosis. *J Am Dent Assoc.* 1934;21:1421-6.
- (6) Beltrán-Aguilar ED, Barker L, Dye BA. Prevalence and severity of dental fluorosis in the United States, 1999-2004. *NCHS data brief*, no 53. Hyattsville, MD: National Center for Health Statistics. 2010.
- (7) National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards.* Washington, DC: The National Academies Press; 2006.

SUMMARY OF RELEVANT ARTICLES

Beltrán-Aguilar ED, Barker L, Dye BA. Prevalence and severity of dental fluorosis in the United States, 1999-2004. *NCHS data brief*, no 53. Hyattsville, MD: National Center for Health Statistics. 2010.

This report describes the prevalence of dental fluorosis in the United States and changes in the prevalence and severity of dental fluorosis among adolescents between 1986-1987 and 1999-2004. The authors analyzed data from the National Health and Nutrition Examination Survey, 1999-2004 and compared the findings with those of the earlier survey. The key findings are:

- Less than one-quarter of persons aged 6-49 in the United States had some form of dental fluorosis.
- Adolescents aged 12-15 had the highest prevalence of dental fluorosis (40.6%). The prevalence was lower among older age groups. The lowest prevalence was among those aged 40-49 (8.7%). The prevalence of dental fluorosis among children aged 6-11 (33.4%) was lower than the prevalence among those aged 12-15 (40.6%).
- Children aged 12-15 in 1999-2004 had higher prevalence of dental fluorosis compared with the same aged children in 1986-1987. In 1986-1987, 22.6% of adolescents aged 12-15 had dental fluorosis; whereas in 1999-2004, 40.7% of adolescents aged 12-15 had dental fluorosis. The estimates for severe alone were statistically unreliable. The prevalence of very mild fluorosis increased from 17.2% to 28.5% and mild fluorosis increased from 4.1% to 8.6%. The prevalence of moderate and severe fluorosis increased from 1.3% to 3.6%.

Levy SM, Broffitt B, Marshall TA, Eichenberger-Gilmore JM, Warren JJ. Associations between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. *J Am Dent Assoc.* 2010;141(10):1190-1201.

The authors described associations between dental fluorosis and fluoride intakes, with an emphasis on intake from fluoride in infant formula.

The authors administered periodic questionnaires to parents to assess children's early fluoride intake sources from beverages, selected foods, dentifrice and supplements. They later assessed relationships between fluorosis of the permanent maxillary incisors and fluoride intake from beverages and other sources. The authors determined effects associated with fluoride in reconstituted powdered infant formulas, along with risks associated with intake of fluoride from dentifrice and other sources.

Considering only fluoride intake from ages 3 to 9 months, the authors found that participants with fluorosis on the permanent upper incisors (97 percent of which was mild) had significantly greater cumulative fluoride intake

from reconstituted powdered infant formula and other beverages with added water than did those without such fluorosis. Considering only intake from ages 16 to 36 months, participants with fluorosis had significantly higher fluoride intake from water by itself and dentifrice than did those without fluorosis. In a model combining both the 3- to 9-months and 16- to 36-months age groups, the significant variables were fluoride intake from reconstituted powdered concentrate formula (by participants at ages 3-9 months), other beverages with added water (also by participants at ages 3-9 months), and dentifrice (by participants at ages 16-36 months).

The authors concluded that greater fluoride intake from reconstituted powdered formulas and other water-added beverages, when participants were age 3-9 months, increased fluorosis risk, as did higher dentifrice intake by participants when age 16 to 36 months. The authors recommended that prevalence of mild dental fluorosis could be reduced by avoiding ingestion of large quantities of fluoride from reconstituted powdered concentrate infant formula and fluoridated dentifrice.

Hiroko I, Kumar JV. The association between enamel fluorosis and dental caries in U.S. school children. *J Am Dent Assoc.* 2009;140:855-62.

The purpose of the study was to investigate the relationship between enamel fluorosis and dental caries at the tooth level. The authors obtained data from a 1986-1987 oral health survey of U.S. school children to determine the prevalence of caries and enamel fluorosis in 7-17 year olds with a history of a single residence. To focus their analysis at the tooth level, they selected the permanent maxillary right first molar as the index tooth.

The result of the investigation showed the mean decayed, missing and filled permanent tooth surfaces (DMFS) in children with enamel fluorosis to be consistently lower than those without enamel fluorosis. Molars without fluorosis had a higher count of DMFS and higher caries prevalence than molars with fluorosis.

The investigators' conclusion was that policy makers should consider the caries preventive benefits associated with milder forms of enamel fluorosis when making policy changes to reduce the degree of fluoride exposure.

Levy SM. An update on fluorides and fluorosis. *J Can Dent Assoc.* 2003;69(5):286-91.

The author reviewed the literature regarding dental fluorosis, its definition, its appearance, its prevalence based on the pre- and post-eruptive use of fluoride., the esthetic perceptions, and of fluoride levels in foods and beverages. The author also discussed the findings in an Iowa Fluoride Study, the goal of which was to assess the patterns of fluoride intake and dental fluorosis over time. He also summarized the recommendations of the U.S. Center for Disease Control and Prevention for using fluoride to prevent and control dental caries in the United States. He stated that the need to balance the benefits of the different modalities of fluoride use with the risk of fluorosis had made decisions concerning the recommendations for its use more complex.

The overriding points highlighted from these studies was that total fluoride intake was the true risk factor for fluorosis, in spite of the acknowledgement that that value was difficult to quantify. Therefore, documented risk factors for children where the beginnings of fluorosis are important, are fluoride in water, in infant formula reconstituted with fluoridated water, dentifrice, and fluoride supplements. For liquid formulas, soy-based formulas tended to be higher in fluoride content than milk-based formulas.

The author stated further that the optimum level of fluoride intake, though not known with certainty, was on an average 0.05 – 0.07 mg/kg of body weight.. With sources of fluoride topically being professionally applied gels, varnishes, foams, and dentifrice, and systemic sources being water, certain juices, and supplements, the intake of fluoride could easily exceed the suggested optimum level. From the Iowa Fluoride Study, for example, it was found that about 25% of the children were ingesting an estimated 0.8 mg of fluoride daily, and 10% were ingesting more than 1 mg daily based on the days assessments were conducted. Approximately 12% of the children had mild fluorosis of the primary teeth.

The author concluded with the recommendation that supplemental fluoride should be prescribed on sound information about the patient, most importantly whether the patient was at high risk for dental caries. Otherwise, fluoridated water and dentifrice should remain the mainstays of fluoride delivery for all.

Beltrán-Aguilar ED, Griffin SO, Lockwood SA. The prevalence and trends in enamel fluorosis in the United States from the 1930s to the 1980s. *J Am Dent Assoc.* 2002;133:157-65.

The purpose of this article was to describe the prevalence and severity of enamel fluorosis since the classic epidemiological studies of H.Trendly Dean were published (1930s). The authors selected a sample from a data set compiled by the National Institute for Dental Research (NIDR) in 1986-1987 of U.S school children, ages 12-14, living in a household served by the public water system during the child's first eight years of life. Comparison of the two studies showed an increase in prevalence of dental fluorosis in the 1986-1987 period over the 1930s. The prevalence of fluorosis varied by the type of water system. The highest prevalence was seen in children living in areas whose public water system was naturally fluoridated (4.0 ppm fluoride ions), followed by those living in optimally fluoridated areas (0.7-1.2 ppm fluoride ions). Fluorosis prevalence was lowest in children living in sub-optimally fluoridated areas (< 0.7ppm fluoride ions). The dental fluorosis prevalence rates in the order of highest to lowest were 38.7%, 25.8% and 15.5%. However, the greatest relative increase in the prevalence of fluorosis since the 1930s was observed in children living in areas with sub-optimal water fluoride levels (6.5% in 1930 to 15.5% in 1986-87). This suggests that other sources of fluoride apart from water fluoridation may have contributed to this increase.

The authors concluded by stating that the increase in the prevalence of fluorosis from the 1930s to the 1980s may be explained by the increased exposure of children to multiple sources of fluoride.

ADDITIONAL CREDIBLE ONLINE RESOURCES

Centers for Disease Control and Prevention: Dental fluorosis
http://www.cdc.gov/fluoridation/safety/dental_fluorosis.htm

American Dental Association: Fluoridation facts
http://www.ada.org/sections/newsAndEvents/pdfs/fluoridation_facts.pdf

U.S Centers for Disease Control and Prevention: Recommendations for using fluoride to prevent and control caries in the U.S. *MMWR.* 2001;50(RR-14):1-42.
<http://www.cdc.gov/mmwr/PDF/rr/rr5014.pdf>

The Center for Fluoride Research Analysis is endorsed by the American Association of Public Health Dentistry and is dedicated to communicating the quality of fluoride-related studies.

For more information visit FluorideScience.org



INFANT FORMULA

CENTER FOR FLUORIDE RESEARCH ANALYSIS

INFANT FORMULA

Infant formula may be consumed in whole or in part, by infants who are not breast-fed, from birth to age 12 months and older. It is sold in the US in powdered form, as a concentrated liquid, or as a ready-to-feed formula. Breast milk and ready-to-feed formulae contain little fluoride, but studies cited in the 2006 NRC report of "Fluoride in Drinking Water: A Scientific Review of EPA's Standards" raised the possibility that infants could receive a greater than optimal amount of fluoride if using powdered or liquid concentrate formulae reconstituted with water that contains various concentrations of fluoride. The milk and soy-based liquid concentrate and powdered formulae themselves contain low levels of fluoride. Fluoridated water is frequently used to prepare infant formula, so researchers have assessed fluoride's impact on infants.

All major health organizations, including the Centers for Disease Control and Prevention (CDC), the American Academy of Pediatrics (AAP), and the American Dental Association (ADA) agree fluoride

strengthens infants' teeth as they grow, making them more resistant to the tooth decay that could otherwise cause significant problems over time. However, infants who regularly consume formula mixed with fluoridated water can get light white streaks on their permanent teeth, a condition known as dental fluorosis. The effect is mostly subtle cosmetic change to the enamel, so it's unlikely to be noticed outside of a dental examination.

All major organizations... agree fluoride strengthens infants' teeth as they grow, making them more resistant to the tooth decay that could otherwise cause significant problems over time.

RECOMMENDATIONS

When Breastfeeding is Not an Option

Doctors typically advocate exclusive breastfeeding as the optimal form of nutrition until the child is six months old, and continued breastfeeding until the child is at least 12 months of age, unless specifically contraindicated. For infants who cannot be breastfed for whatever reason, the doctors give the following guidance:

- Continue use of liquid or powdered concentrate infant formulas reconstituted with optimally fluoridated drinking water, with a concentration of 0.7 to 1.2 mg/L fluoride.
- If the potential risk for dental fluorosis is a concern, use ready-to-feed formula or liquid or powdered concentrate formula reconstituted with water that is either fluoride-free or has low concentrations of fluoride. Low fluoride bottled waters tend to be labeled as deionized, purified, demineralized, distilled, or produced through reverse osmosis.

This recommendation is based on a review by an expert panel set up by the American Dental Association. Two of the most cited sources for these recommendations include the American Dental Association Council on Scientific Affairs' examination of *Evidence-Based Clinical Recommendations Regarding Fluoride Intake From Reconstituted Infant Formula and Enamel Fluorosis* in 2011 and the Centers for Disease Control and Prevention's *Overview: Infant Formula and Fluorosis* (1-2).

- (1) Berg J, Gerweck C, Hujoel PP et al. Evidence-based clinical recommendations regarding fluoride intake from reconstituted infant formula and enamel fluorosis: a report of the American Dental Association Council on Scientific Affairs. *J Am Dent Assoc.* 2011;142(1):79-87.
- (2) Centers for Disease Control and Prevention. Overview: infant formula and fluorosis. Available from: http://www.cdc.gov/fluoridation/safety/infant_formula.htm.

SUMMARY OF RELEVANT ARTICLES

Hujoel PP, Zina LG, Moimaz SAS, Cunha-Cruz J. Infant formula and enamel fluorosis: a systematic review. *J Am Dent Assoc.* 2009;140:841-54.

The authors conducted a systematic review of controlled studies regarding the risk of developing enamel fluorosis associated with use of infant formula.

After evaluating 969 potentially eligible published studies, the reviewers found that the authors of 17 of these 19 studies reported Odds Ratios (OR), and, among these, infant formula consumption was associated with a higher prevalence of enamel fluorosis in the permanent dentition (summary OR 1.8, 95 percent confidence interval [CI] 1.4–2.3). There was significant heterogeneity among studies (I^2 66 percent) and evidence of publication bias ($P = .002$). A metaregression analysis indicated that the ORs associating infant formula with enamel fluorosis increased by five percent for each 0.1-part-per-million increase in the reported levels of fluoride in the water supply (OR 1.05, 95 percent CI 1.02–1.09). This suggests that infant formula consumption was associated with a higher prevalence of enamel fluorosis in the permanent dentition, more indicative of the level of the fluoride in the water supply,.

The evidence that the fluoride in the infant formula caused enamel fluorosis was weak, as other mechanisms could explain the observed association.

Levy SM, Broffitt B, Marshall TA, Eichenberger-Gilmore JM, Warren JJ. Associations between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. *J Am Dent Assoc.* 2010;141(10):1190-1201.

In this paper, the authors describe associations between dental fluorosis and fluoride intake based on a study conducted in Iowa.

The authors administered periodic questionnaires to parents to assess children's early fluoride intake sources from beverages, selected foods, dentifrice, and supplements. They later assessed relationships between fluorosis of the permanent maxillary incisors and fluoride intake from beverages and other sources.

Considering only fluoride intake from ages three to nine months, the authors found that participants with fluorosis (97 percent of which was mild) had significantly greater cumulative fluoride intake (AUC) from reconstituted powdered infant formula and other beverages with added water than did those without fluorosis.

Greater fluoride intakes from reconstituted powdered formulas (when participants were aged three to nine months) and other water-added beverages (when participants were aged three to nine months) increased fluorosis risk, as did higher dentifrice intake by participants when aged 16 to 36 months.

ADDITIONAL CREDIBLE ONLINE RESOURCES

U.S. Centers for Disease Control and Prevention: Infant formula and fluorosis

http://www.cdc.gov/fluoridation/safety/infant_formula.htm

American Dental Association: Infant formula and fluoridated water

<http://jada.ada.org/content/142/1/79.full>

American Dental Association: Reconstituted Infant Formula and enamel fluorosis

http://ebd.ada.org/contentdocs/ADA_Evidence-based_Infant_Formula_Chairside_Guide.pdf

National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: The National Academies Press; 2006.

http://www.nap.edu/catalog.php?record_id=11571

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INTELLIGENCE QUOTIENT (IQ)

Water fluoridation represents a public health intervention that has been shown to be effective in preventing dental decay. The safety of fluoridation is well established and the process for assuring continued safety is ongoing. Because of concerns about the effects of environmental agents such as lead, mercury and arsenic on developing brain, some researchers are curious to see if there is a similar effect of fluoride on the brain.

Studies that have been widely cited raise questions about the potential effects of high levels of fluoride on intelligence and behavior. Those same studies reference low fluoride exposure levels and point to no observable effect on intelligence and behavior at those levels. The reference exposure levels are often higher than or consistent with exposure levels commonly seen in the US. Here we present a summary based on expert reviews regarding the potential for toxic effects on brain (neurotoxicity) and behavior arising from fluoride exposure.

The National Research Council's (NRC) Committee on Fluoride in Drinking Water examined the evidence on the potential adverse health effects of much higher levels of fluoride in drinking water (1). According to that Committee, *"At the present time, questions about the effects of the many histological, biochemical, and molecular changes caused by fluoride cannot be related to specific alterations in behavior or any known disease."*

Recently, several studies conducted in China, Mexico and India have claimed that high fluoride in drinking water could lead to lower IQ levels among children (2). These were cross-sectional or ecological studies with study designs which were inherently weak in terms of their ability to draw conclusions about cause and effect.

At the present time, questions about the effects of the many histological, biochemical, and molecular changes caused by fluoride cannot be related to specific alterations in behavior or any known disease

-NRC (2006)

The most important problem with this type of study is differentiating cause and effect from simple association. For example, a study finding an association between high level of pollution and lower IQ does not demonstrate whether pollution lowers IQ levels or low IQ persons tend to stay in polluted areas because they cannot find jobs anywhere else. Often there are a number of plausible explanations exist for an association and it is imperative to rule them out. Further, the one-time measurement of fluoride concentration in drinking water in some wells is not necessarily indicative of fluoride levels in the water over a period of time or that all persons necessarily received that water for a prolonged period of time. In general, cross-sectional studies and ecological studies should be used for formulating research hypotheses for further testing utilizing rigorous research methods.

Several of the studies were conducted in rural China where the living conditions were poor and water was not clean. Choi et al pointed out that it had actually been projected that residents in rural areas would have access to safe public drinking water by 2020 (3). According to one such study by Wang San-Xiang and colleagues *"This region is very poor, even by Chinese standards, with an annual income of approximately US\$120 per family"* (4).

To assess the quality of these studies, the South Central Strategic Health Authority in the United Kingdom requested an independent group of experts at Bazian, a reputable group of researchers to conduct a review (2). According to this review, *"In our appraisals we found that the study design and methods used by many of the researchers had serious limitations. The lack of a thorough consideration of confounding as a source of bias means that, from these studies alone, it is uncertain how far fluoride is responsible for any impairment in*

intellectual development seen. The amount of naturally occurring fluoride in drinking water and from other sources and the socioeconomic characteristics in the areas studied is different from the UK and so these studies do not have direct application to the local population of Southampton." A similar statement could be made for exposure to fluoride in the US from community water fluoridation, where the optimal fluoridation level is in the range of 0.7 -1.2 mg/L,

Choi et al recently published a systematic review of 27 epidemiological studies carried out in rural China and in Iran, 17 of which were reviewed by the Bazian Group mentioned above (3). The aim of this systematic review was to include in the open literature studies published previously only in China, and to research the possibility of fluoride being considered a neurotoxicant during child development. Again, where quantified, the fluoride exposures through drinking water ranged to a high of 11.5 mg/L., several times the community water fluoridation level experienced here in

the US. The authors themselves pointed out the deficiencies and methodological limitations of the studies, and the low quality of the data. Major confounders which were not assessed appropriately were parental education and income, high arsenic levels in drinking water, arsenic and fluoride included in the diet through coal burning, iodine exposure levels, and actual levels of exposure of the individual children to fluoride were not known. Since most studies were cross-sectional, the one-time measure of the level of fluoride in drinking water was seen to be appropriate for an assumed stable population over time. The authors calculated a decrease in average IQ with high fluoride exposures. This value was however, within experimental error of IQ testing.

Whitford et al tested the effects of high levels of fluoride on the ability to learn in rats under controlled experimental conditions (5). The authors concluded that there were no significant differences among the groups in learning or performing the response.

- (1) National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: The National Academies Press; 2006.
- (2) Bazian Ltd. *Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ: a report for South Central Strategic Health Authority*. London, UK: Bazian Ltd; 2009 February 11.
- (3) Choi AL, Sun G, Zhang Y, Grandjean P. Developmental fluoride neurotoxicity: a systematic review and meta-analysis. *Environmen Health Perspect*. 2012 July 20. [Epub ahead of print].
- (4) Wang SX, Wang ZH, Cheng XT, et al. Arsenic and fluoride exposure in drinking water: children's IQ and growth in Shanyin County, Shanxi Province, China. *Environmen Health Perspect*. 2007;115(4):643-7.
- (5) Whitford GM, Whitford JL, Hobbs SH. Appetitive-based learning in rats: lack of effect of chronic exposure to fluoride. *Neurotox Teratol*. 2009;31:210-5.

SUMMARY OF RELEVANT ARTICLES

Whitford GM, Whitford JL, Hobbs SH. Appetitive-based learning in rats: lack of effect of chronic exposure to fluoride. *Neurotox Teratol*. 2009;31:210-5.

The authors conducted a laboratory study using 32 female rats. These rats were provided with water containing different doses of fluoride (0, 2.9, 5.7, 11.5 mg/kg body weight/day) for eight months. These rats were tested for their ability to learn a response for food.

The authors observed that there was no evidence of learning deficits in any of the fluoride-exposed groups. Although not statistically significant, it was the non-fluoridated control group that took longer to reach criterion for acquiring the bar-press response ((0 fluoride 6.38 ± 0.38 days), (2.9mg/kg 5.75 ± 0.37 days), (5.7mg/kg 5.63 ± 0.46 days), (11.5mg/kg 5.63± 0.42)). The authors concluded that there were no significant differences among the groups in learning or performing the response. "*Chronic ingestion of fluoride at levels up to 230 times more than that experienced by humans whose main source of fluoride is fluoridated water had no significant effect on appetitive-based learning.*"

Wang SX, Wang ZH, Cheng XT, et al. Arsenic and fluoride exposure in drinking water: children's IQ and growth in Shanyin County, Shanxi Province, China. *Environ Health Perspect.* 2007;115(4):643-7.

The authors measured the intelligence quotient (IQ) in 720 school-age children, 8-12 years old, residing in rural villages in China. The study was conducted to determine the effect of high arsenic and high fluoride (190 ± 183 microgram/L As and 8.3 ± 1.9 mg/L F) on IQ. A control group of people receiving low arsenic and low fluoride (2 ± 3 micrograms/L As and 0.5 ± 0.2 mg F/L) was used as a comparison group. It should be noted that the level of fluoride in the control group is equivalent to a fluoridated community in the US. Hence, the study population in the high fluoride exposure is not representative of individuals drinking fluoridated water in the US. Also, the authors acknowledged the fact that the distribution of children's IQ is slightly skewed in the control group. The average IQ for the high fluoride group was 100.5, Standard Deviation (SD) ± 15.8 while the average IQ for the control group was 104.8, SD ± 14.7 . The average IQ of Chinese children was reported to be 103.5, SD ± 17.7 . Children exposed to high arsenic had an average IQ of 95.1, SD ± 16.6 .

The authors observed a significant effect of arsenic exposure on children's intelligence. The authors also expressed caution in interpreting the results of the study by acknowledging that children's intelligence, growth and development can be influenced by many factors such as inheritance, nutrition, geography, education and society. The authors stated that they could not rule out the effect of arsenic in the high fluoride group as they did not assess the exposure in a large proportion of children in the high fluoride group.

Bazian Ltd. *Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ: a report for South Central Strategic Health Authority.* London, UK: Bazian Ltd; 2009 February 11.

According to this report, the studies reporting an association between high fluoride level and IQ were conducted in China, Mexico, Iran and India. These studies used cross-sectional or ecological methods to investigate whether high environmental exposure to fluoride or arsenic or low exposure to iodine was associated with lower IQ.

According to this independent report, the lack of a thorough consideration of confounding as a source of bias means that, from these studies alone, it is uncertain how far fluoride is responsible for any impairment in intellectual development seen. Bazian acknowledged that these confounding factors (parental education, socioeconomic measures and environmental exposures to other chemicals such as arsenic and iodine in water) could explain some or all of the impairment in IQ. The report also mentioned that sources of fluoride exposure that exist in China and India do not exist in the UK, for example, the burning of high fluoride coal and the practice of eating contaminated grain, which can substantially contribute to fluoride exposure.

Choi AL, Sun G, Zhang Y, Grandjean P. Developmental fluoride neurotoxicity: a systematic review and meta-analysis. *Environ Health Perspect.* 2012 July 20. [Epub ahead of print].

The authors specifically evaluated by meta-analysis 27 epidemiological studies on the relationship between high fluoride exposure in drinking water and delayed neurobehavioral development in children in rural areas of China, including 2 studies from Iran. The studies cited were carried out from 1989 through 2011 and compared high and reference fluoride exposures. The outcome measured for the individual studies was general intelligence using The Combined Raven's Test - The Rural edition in China (CRT-RC) (16 of the studies), the Weschler Intelligence Tests (3 of the studies), Binet IQ Test (2 of the studies, more specifically the Chinese Binet and the Binet-Siman), Raven's Test (2 of the studies), Japan IQ Test (2 of the studies), the Chinese Comparative Intelligence Test (1 of the studies), and the Mental Work Capacity Index (1 of the studies). The children ranged in age overall from 4 (2 of the studies) to 16 years old, and were not analyzed based on gender, parental education or income. Statistical analyses of the data included finding standardized weighted mean differences of the accumulated scores using fixed-effects and random-effects models, determining the presence of heterogeneity, and performing sensitivity analyses on studies that used similar tests to measure the outcome. The authors found the suggestion of an inverse relationship between high fluoride exposure and children's intelligence. They could not derive an exposure limit because the actual exposures and possible routes of exposure of the individual children were unknown. In addition, they found that the reports were quite brief, that complete information on variables was not available, that each of the articles reviewed had deficiencies and in some, quite serious deficiencies, that there were limitations on methodology, all of which influenced the extent to which any firm

conclusion could be drawn from the results. However, they nevertheless stated the following: "*Although the studies were generally of insufficient quality, the consistency of their findings adds support to existing evidence of fluoride-associated cognitive deficits, and suggest that potential developmental neurotoxicity of fluoride should be a high research priority.*"

ADDITIONAL CREDIBLE ONLINE RESOURCES

National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: The National Academies Press; 2006.

http://www.nap.edu/catalog.php?record_id=11571

Bazian Ltd. *Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ: a report for South Central Strategic Health Authority*. London, UK: Bazian Ltd; 2009 February 11.

<http://www.fairbanksalaska.us/wp-content/uploads/2011/07/20090211Bazian-Review-IQ-Studies.pdf>

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KIDNEY HEALTH

Fluoride is present in drinking water at varying concentrations. Fluoridated water at concentrations between 0.7 and 1.2 mg/L reaches over 184 million people in the United States. After drinking water or beverages, or eating food which contains fluoride, roughly half of the fluoride is absorbed and retained mainly in bones and teeth. The remaining fluoride is filtered out by the kidneys and cleared from the body in urine. Because of this relationship with the kidneys, some people have questioned whether or not adding fluoride to the water is safe for kidney health. In the United States, more than 10% of people age 20 or older suffer from chronic kidney disease, making the question of kidney safety especially important.

In 2006, the National Research Council released the report *Fluoride in Drinking Water*, which assessed the health effects of naturally-occurring fluoride at concentrations which are four times or more than the level found in fluoridated drinking water (1). Further reviews of the research were conducted by Kidney Health Australia in 2007 and 2011 and the National

Kidney Foundation in 2008 (2-4). The overall conclusions were that, although research on the topic is limited, the evidence of the safety of fluoridation supported the continued use of water from fluoridated community water systems for people both with healthy kidneys and those with kidney disease, for drinking water purposes.

The evidence supports the continued use of water from fluoridated community water systems for people both with healthy kidneys and those with kidney disease, for drinking water purposes.

- (1) National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: The National Academies Press; 2006.
- (2) Kidney Health Australia. The risks of consumption of fluoridated water for people with chronic kidney disease: a position statement. Australia: 2007 September.
- (3) Kidney Health Australia. 2011 Review of Kidney Health Australia fluoride position statement. Australia: 2011 September 13.
- (4) National Kidney Foundation. Fluoride intake in chronic kidney disease. 2008 April 25.

SUMMARY OF RELEVANT ARTICLES

Kidney Health Australia. 2011 Review of Kidney Health Australia fluoride position statement. Australia: 2011 September 13.

In 2007, an extensive literature review of the effects of fluoride on kidney health was published which formed the basis for the 2007 Kidney Health Australia position statement. The findings are summarized below:

- There is no evidence that consumption of optimally fluoridated drinking water increases the risk of developing chronic kidney disease (CKD), although only limited studies addressing this issue are available.
- There is consistent evidence that impairment of kidney function results in changes to the way in which fluoride is metabolized and eliminated from the body resulting in an increased burden of fluoride.
- There is no evidence that consumption of optimally fluoridated drinking water poses any health risks for people with CKD, although only limited studies addressing this issue are available.
- There is limited evidence that people with stage 4 or 5 CKD who ingest substances with a high concentration of fluoride (which exceeds the optimal dose) may be at risk of fluorosis.
- Monitoring of fluoride intake and avoidance of fluoride-rich substances would be prudent for people with stage 4 or 5 CKD, in addition to regular investigations for possible signs of fluorosis.
- Fluoride concentrations in the final feed water to the dialysis machine must comply with established water quality guidelines

In 2011, Kidney Health Australia (KHA) responded to calls to update their position due to research which had been published since the 2007 review. A new systematic review was conducted to include any new research which had been published up to 2011. The new research resulted in the identification of only one new study eligible for inclusion. According to this review "Itai and colleagues investigated fasting serum fluoride concentrations in a cohort of healthy subjects aged 40 to 69 years. Using estimated glomerular filtration rate (eGFR) they confirmed that serum fluoride concentrations in healthy adults increase with an age-related decline in kidney function. However, the clinical significance of this finding is unclear, as both the mean serum fluoride concentrations and eGFR values were within the normal ranges." The new study reiterated the conclusion that there was consistent evidence that impairment of kidney function resulted in changes to the way in which fluoride was metabolized and eliminated from the body, thereby giving rise to an increased burden of fluoride. It was, therefore, concluded that there was no new published evidence to contradict the 2007 KHA Position Statement.

National Research Council. *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*. Washington, DC: The National Academies Press; 2006.

The 2006 National Research Council report examined whether or not there was a link between fluoride and kidney stones, the mechanism of fluoride toxicity on renal tissue at high doses, and what special considerations should be made for people with kidney failure who live in areas with naturally high levels of fluoride in the water. Based on an analysis of the published research, it was concluded that:

- No published studies were found which suggested that consuming fluoride at 1 mg/L, the level found in community water fluoridation, could affect the kidney. Research carried out on over 18,000 people who lived in India where the fluoride concentration in drinking water ranged from 3.5 to 4.9 mg/L showed a greater likelihood for the development of kidney stones by those who had signs and symptoms of skeletal fluorosis. Kidney stone formation, however, could have been due to malnutrition, and the authors concluded that such research should be carried out in the US, in areas where the drinking water was 4 mg/L in fluoride concentration.
- The results of animal studies helped to determine how the kidney responded to high doses of fluoride. ATP-dependent calcium uptake in rat kidneys, the ATP-ase pump in cultured rabbit ascending loop cells, and kidney phospholipids all were significantly affected by high doses of fluoride.
- People with impaired renal function, or currently on dialysis due to renal failure, tended to accumulate fluoride in bone much more quickly than normal.. What was not clear was whether bone changes in renal osteodystrophy could be attributed to excess bone fluoride accumulation alone, or whether it could have been due to combination with other elements such as magnesium and aluminum. For all patients undergoing dialysis the water used for dialysis should meet the required guidelines for water quality published by their equipment manufacturer.

National Kidney Foundation. Fluoride intake in chronic kidney disease. 2008 April 25.

In 2008, the National Kidney Foundation (NKF) reviewed their 1981 position paper on fluoridation in light of the 2006 NRC report and other updated studies. The NKF stated that the 1981 paper was outdated and withdrawn, and that as of 2008 the NKF had no position on the optimal fluoridation of water. The NKF, however, had several key recommendations and findings:

- “Dietary advice for patients with Chronic Kidney Disease (CKD) should primarily focus on established recommendations for sodium, calcium, phosphorus, energy/calorie, protein, fat, and carbohydrate intake. Fluoride intake is a secondary concern.”
- Due to a lack of randomized trials specific to patients with chronic kidney disease, the NKF does not have specific recommended levels of fluoride intake for persons with CKD and recommends further research.
- Monitoring total fluoride intake can be difficult due to a lack of labeling on foods and beverages.
- All dialysis treatment should follow standards set by the Association of the Advancement of Medicinal Instrumentation (AMMI). Failure to use the recommended water treatment processes like reverse osmosis or deionization and management protocol could result in fluoride intoxication, especially when operator errors could include the addition of excess fluoride to the public water system, or the use of exhausted ion exchange resins.
- The risk for persons with Chronic Kidney Disease from fluoride is likely greatest in areas with high levels of naturally occurring fluoride. Persons with CKD should be notified of the potential risk of fluoride exposure by providing information on the National Kidney foundation website, including information from the NRC report and the Kidney Health Australia position paper.

ADDITIONAL CREDIBLE RESOURCES

Kidney Health Australia: Position statements and publications

<http://www.kidney.org.au/HealthProfessionals/PublicationsforHealthProfessionals/tabid/635/ItemId/1176/Default.aspx>

National Kidney Foundation: Fluoride

<http://www.kidney.org/atoz/content/fluoride.cfm>

The Center for Fluoride Research Analysis is endorsed by the American Association of Public Health Dentistry and is dedicated to communicating the quality of fluoride-related studies.

For more information visit FluorideScience.org



TOOTH DECAY

Tooth decay or dental caries, is one of the most common chronic diseases experienced by children and adults in the United States. It is a multifactorial, infectious process caused by cariogenic bacteria resulting in the dissolution of tooth structure, thus causing pain and suffering to the patient. Cariogenic bacteria and inadequate oral hygiene, in addition to a diet consisting of an increased amount of acids, sugar and carbohydrates, can lead to tooth decay. Once the tooth structure has been destroyed, the bacteria inside the tooth continues to spread leading to pulpal necrosis and acute systemic infection, unless the tooth is physically removed by a dentist.

The control of this widespread disease came as a result of extensive epidemiological studies of people living in communities with varying levels of fluoride in drinking water, which showed a strong inverse relationship between dental caries and levels of fluoride (1). In time, it was shown that dental caries in children was reduced by 50 – 70% with the intervention of fluoridated water (2). In 1962 the U.S. Public Health Service published the recommendations for optimal fluoride concentrations in drinking water, and were based on ambient air temperature of geographic areas and ranged from 0.7-1.2 mg/L. With fluoride in drinking water judged to be a public health measure to control dental caries, many ways of incorporating fluoride into daily use were implemented. The most widespread of these was the introduction of fluoride into toothpaste. Fluoride was also made available via dental rinses, gels, foams, varnishes, tablets and mouth drops. All of these sources added to the daily intake of the fluoride ion. Countries in Europe, Latin America, and the Caribbean chose to add fluoride to table salt (3).

Although the avoidance excessive amount of sugary diet and proper oral hygiene could reduce the incidence of tooth decay, the only practical approach to prevent tooth decay is through the use of fluoride. Fluoride naturally occurs in our drinking water, but the levels are not adequate enough in most communities to reduce tooth decay.

Community water fluoridation, the process of adding 0.7 to 1.2 mg of fluoride to drinking water has an active role to play in improving the oral health of Americans. Having been the primary intervention pathway for the prevention of dental caries for close to sixty years with large reductions in tooth decay in many industrialized countries, its effectiveness and return on investment have been proven (4-5). Now, however, it is important to focus on its continued use due to cost savings, safety, and ready availability to everyone despite their socioeconomic status. Currently, while there are numerous fluoride-containing products available to consumers, the frequency in the use of these products depends on the individual's age, behavior, and finances. Community water fluoridation is an easy way to deliver fluoride to members of a community regardless of their ability to obtain other fluoride-containing products.

Almost all national organizations involved in controlling tooth decay including the Centers for Disease Control and Prevention, the American Dental Association, and the U. S. Surgeon General have endorsed optimal fluoridation of community drinking water as a safe and, cost-effective intervention to prevent dental caries. Recommendations for the prevention of dental caries include: a healthy diet, proper oral hygiene which includes brushing twice daily with a fluoride toothpaste using a soft toothbrush, and using optimally fluoridated water as a source of drinking water.

Fluoride naturally occurs in our drinking water, but the levels are not adequate enough in most communities to reduce tooth decay. Community water fluoridation plays an important role in improving the oral health of Americans.

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- (5) McDonagh MS, Whiting PF, Wilson PM, Sutton AJ, Chestnut I, Cooper J et al. Systematic review of water fluoridation. *Br Med J*. 2000;321:855-9.

SUMMARY OF RELEVANT ARTICLES

Benedict TI, Gooch BM, Sulemana I et al. Reviews of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries. *Am J Prev Med*. 2002;23(1S):21-54.

The Task Force on Community Preventive Services conducted a systematic review of the effectiveness, applicability, economic evaluations, positive and negative effects, and barriers associated with population-based interventions that target the prevention or control of dental caries. Thirty studies were reviewed by the Task Force, which evaluated the effectiveness of initiating or terminating community water fluoridation and its ability to reduce dental caries.

Out of the 30 studies, six were excluded due to limitations in research execution and/or design, and three were excluded due to lack of appropriate effect measure. Twenty-one studies qualified for the review. The qualifying studies were conducted in various geographical locations around the world, including the United States. The systematic review of the 21 qualifying studies resulted in the following conclusions:

- When measuring decay rates before and after water fluoridation, the median decrease among children ages 4 to 17 years was 29.1% compared to the control group.
- The decay rates that were measured after water fluoridation only, the median decrease among children 4 to 17 years was 50.7% compared to the control group.
- In communities with children representing various socioeconomic statuses, fluoridation was found to decrease tooth decay in the population.
- Throughout all studies, community water fluoridation was considered to be a cost-saving measure.

The Task Force concluded that there was an adequate amount of strong and sufficient evidence supporting the benefits of community water fluoridation in reducing tooth decay.

McDonagh MS, Whiting PF, Wilson PM, Sutton AJ, Chestnut I, Cooper J *et al*. Systematic review of water fluoridation. *Br Med J*. 2000;321:855-9.

The authors conducted a systematic review of 214 studies using 25 specialist databases on the safety and efficacy of fluoridated water. In this study, four outcome measures were identified: number of children without caries; decayed, missing and filled primary/permanent teeth; difference in the prevalence of caries between baseline to final evaluation in fluoridated areas compared with the control group of non-fluoridated areas; and the possibility of adverse effects.

The studies were combined using a multi-level regression analysis to determine the association between water fluoride concentration and the prevalence of dental fluorosis, which is an esthetic concern to some patients. The study found that water fluoridation was linked to increased proportion of children who did not have dental caries, in addition to a reduction in the amount of teeth affected by dental decay. The range (median) of mean differences in the percentage of children without dental decay was -5.0%-64% (14.6%), while the range (median) of mean of variations in decayed, missing and filled primary/permanent teeth was 0.5 to 4.4 (2.25) teeth. The authors suggested that an estimated twelve percent of people would be exposed to some form of dental fluorosis when fluoride levels were at one part per million.

The authors concluded that, with water fluoridation, a reduction in dental caries should be associated with an increased prevalence of dental fluorosis and that there was no obvious evidence of negative effects linked with consuming fluoridated water.

ADDITIONAL CREDIBLE ONLINE RESOURCES

American Dental Association: Fluoridation Policy and Statements

<http://www.ada.org/4045.aspx>

National Center for Biotechnology Information. PubMed Health: Dental Cavities

<http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002050/>

US Centers for Disease Control and Prevention: Achievements in Public Health, 1900-1999: Fluoridation of Drinking Water to Prevent Dental Caries. MMWR Weekly 1999; 48:933-40.

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4841a1.htm>

US Centers for Disease Control and Prevention. Hygiene Related Diseases: Tooth Decay

http://www.cdc.gov/healthywater/hygiene/disease/dental_caries.html

US Centers for Disease Control and Prevention: Using Fluoride to Prevent and Control Tooth Decay in the United States.

http://www.cdc.gov/fluoridation/fact_sheets/fl_caries.htm

US Centers for Disease Control and Prevention and American Dental Association. Nature's Way to Prevent Tooth Decay: Water Fluoridation

http://www.cdc.gov/Fluoridation/pdf/natures_way.pdf

The Center for Fluoride Research Analysis is endorsed by the American Association of Public Health Dentistry and is dedicated to communicating the quality of fluoride-related studies.

For more information visit FluorideScience.org

Community Water Fluoridation: What Opponents Say and Why It Doesn't Hold Up

The Campaign for Dental Health

www.iLikeMyTeeth.org



Many arguments from anti-fluoride activists misrepresent what the research shows. For decades, anti-fluoride activists have tried to link fluoride or fluoridated water to a long list of different health problems—from bone cancer to difficulty losing weight—but without offering solid evidence to back up these accusations.¹ Here are some examples of the misleading or inaccurate statements that anti-fluoride groups make to attack fluoridation's value and safety:

Claim #1

“Fluoride causes cancer.”

The Facts:

For years, opponents have made this argument, but the claim doesn't stand up to the evidence.

- In 2011, a U.S. study found no link between the fluoride and bone cancer.² The design of this study was approved by the National Cancer Institute. The study is also considered very reliable because—unlike previous studies—it examined actual fluoride levels in bone.
- In October 2011, after lengthy review, a committee of California's Office of Environment Health Hazard Assessment voted unanimously that the evidence did not support classifying fluoride as a cancer-causing substance.³

Claim #2

“Fluoridation is harmful because it causes a condition called fluorosis.”

The Facts:

- Nearly all fluorosis in the U.S. is a mild, cosmetic condition that leaves faint white streaks on teeth. It does not cause pain, and it does not affect the health or function of the teeth. It's so subtle that most people with mild fluorosis cannot detect it—only a dentist is likely to notice it.⁴
- Dental fluorosis occurs among some people in all communities, even those that do not fluoridate their local water systems.⁵ For example, there is fluorosis in Norway, a

country that does not fluoridate its public water systems.⁶ Fluorosis occurs when young children consume an excessive amount of fluoride from any source.

- Experts believe that the main reason for fluorosis is that some young children swallow fluoride toothpaste.⁷ Toothpaste contains a concentration of fluoride that is roughly 1,000 times higher than the level in fluoridated water.⁸ This is why parents of children under the age of 6 are advised to supervise their kids' tooth-brushing and apply only a pea-sized amount of toothpaste to the toothbrush.⁹
- Anti-fluoride websites display photos of people with a severe form of fluorosis who live in India and other places to paint an inaccurate picture of fluorosis.¹⁰ These people have severe fluorosis because some water supplies in their countries have extremely high, *natural* levels of fluoride. The fluoride in these water supplies in India are not adjusted down to the level used to fluoridate public water systems in the U.S.

Claim #3

“Fluoride must pose a danger because there’s a warning label on toothpaste.” Anti-fluoride groups claim the existence of this label, required by the Food and Drug Administration (FDA), means that fluoride poses a danger. But here are the facts:

The Facts:

- Every single day, millions of Americans use fluoride toothpaste without any negative effect whatsoever. This warning label simply reflects two facts:
 - The fluoride concentration in toothpaste is roughly 1,000 times higher than that of fluoridated water.
 - Young children’s use of toothpaste should be supervised by a parent.
- The American Dental Association (ADA) believes the warning label on toothpaste exaggerates the potential for negative health effects from swallowing toothpaste. In 1996, the ADA reviewed studies and concluded that “a child could not absorb enough fluoride from toothpaste to cause a serious problem” and added that fluoride toothpaste has an “excellent safety record.”¹¹

Claim #4

“Europe doesn’t engage in fluoridation, so why should we?” This assertion by anti-fluoride activists is misleading because it ignores the fact that these nations use various means to provide fluoride to their citizens:

The Facts:

- Salt fluoridation is widely used in Europe. In fact, at least 70 million Europeans consume fluoridated salt, and this method of fluoridation reaches most of the population in Germany and Switzerland. These two countries have among the lowest rates of tooth

decay in all of Europe.¹² Fluoridated milk programs reach millions of additional Europeans.¹³

- Fluoridated water is provided to 12 million Europeans, mostly reaching residents of Great Britain, Ireland, Spain and other countries.¹⁴
- Italy has not tried to create a national system of water fluoridation, but there are logical reasons for this. First, the drinking of bottled water is well established in Italian culture. Second, a number of areas in Italy have water supplies with natural fluoride levels that already reach the optimal level that prevents decay.¹⁵
- Technical challenges are a major reason why fluoridated water isn't common in Europe. In France and Switzerland, water fluoridation is logistically difficult because there are tens of thousands of separate sources for drinking water. This is why these countries use salt fluoridation, fluoride-rinse programs and other ways to get fluoride to their people.¹⁶

Claim #5

“Fluoride is a by-product from the phosphate fertilizer industry.” Opponents use this misleading message to associate fluoride with fertilizer.

The Facts:

- Fluoride is extracted from phosphate rock, and so is phosphoric acid—an ingredient in Coke and Pepsi. Neither one of them comes from fertilizer.
- Fluoride is extracted from the same phosphate rock that is later used to create fertilizers that will enrich soil. This is accomplished through an efficient process, and opponents are wrong to suggest that fluoride “comes from fertilizer.”
- The quality and safety of fluoride additives are ensured by Standard 60, a program commissioned by the Environmental Protection Agency (EPA). Standard 60 is a set of standards created and monitored by an independent committee of health experts. This committee provides regular reports to the EPA. More than 80 percent of fluoride additives are produced by U.S. companies, but no matter where they come from, Standard 60 uses on-site inspections and even surprise “spot checks” to confirm the additives meet quality and safety standards.¹⁷

Claim #6

“The National Research Council said that fluoride can have harmful effects.” Opponents point to the NRC’s 2006 report on fluoride as a reason to fear water fluoridation, but they are misrepresenting this report.

The Facts:

- The NRC raised the possibility of health concerns in U.S. communities where the *natural* fluoride levels in well water or aquifers are unusually high. These natural fluoride levels are dramatically higher than the level used to fluoridate public water systems.

- The National Research Council itself explained that its report was not an evaluation of water fluoridation.¹⁸

Claim #7

“There are highly fluoridated states that have higher decay rates than states where fluoridation is less common.” Opponents sometimes compare different states’ fluoridation rates and try to present this as proof that fluoridation doesn’t reduce tooth decay.

The Facts:

- This is an example of junk-science, and here’s why. Water fluoridation is a key factor in decay prevention, but other factors also influence decay rates. Research confirms that low-income people are more at risk for decay than upper income Americans.¹⁹ This makes sense because income status shapes how often a person visits a dentist, their diet and nutrition, and other factors.
- Comparing different states based solely on fluoridation rates ignores some key income differences. For example, West Virginia and Connecticut reach roughly the same percentage of their residents with fluoridated water—91 percent and 90 percent, respectively. Yet the percentage of West Virginians living below the poverty line is nearly double the percentage of those living in Connecticut.²⁰ West Virginians are also more likely to get their drinking water from wells, which are not fluoridated to the optimal level. This is why it’s misleading to do these apples-and-oranges comparisons.
- A more reliable comparison would examine decay-related problems of people from within the *same* state and the *same* income group. A 2010 New York study did precisely this—comparing Medicaid enrollees in counties where fluoridation was prevalent to enrollees in counties where most communities were not fluoridated. The study found that residents of counties where fluoridated water was rare needed 33 percent more fillings, root canals and extractions than those in counties where fluoridated water was common.²¹

Claim #8

“There’s a link between fluoride and lower IQ scores.” Anti-fluoride activists have raised concerns about this, but their argument is based on junk science—flawed studies that were conducted in China and other countries.

The Facts:

- British researchers who evaluated these IQ studies found “basic errors” and wrote that different data were combined in a way “that does not give a valid or meaningful result.”²²
- These Chinese studies failed to rule out other factors, including arsenic exposure, the burning of high-fluoride coal inside homes and the eating of contaminated grain.²³

- Most of the foreign studies cited by anti-fluoride activists involved fluoride levels in drinking water that were more than triple the level recommended for fluoridation in the U.S.²⁴

Claim #9

“The government has never conducted a randomized, control study of fluoridation.”

The Facts:

- Fluoride has been shown to be effective in randomized clinical trials of toothpaste, tablets, and varnish. However, it would be virtually impossible to do such a study for *fluoridation*, and here’s why. A randomized study for fluoridation would require a community to be divided into two groups, and the homes of residents would be assigned randomly to one group or the other. Piping fluoridated water into one home of residents while piping *non*-fluoridated water into the home next door would be logistically impossible.
- Even if it were possible to conduct this kind of randomized study, involving children in such a study could raise ethical concerns because it means one group of kids would be deprived of fluoridated water.
- Numerous clinical studies have proven that fluoridated water protects teeth. Within the past two years alone, studies from Nevada, New York and Alaska have added to the overwhelming evidence that fluoridated water protects teeth from decay.

Claim #10

“Fluoride can harm plants and animals that live in the wild.”

The Facts:

- The fluoride level in a fluoridated water system is not high enough to harm any plant or animal species.²⁵
- Anti-fluoride groups claim that runoff from fluoridated water can harm fish. But research shows that this runoff does not cause any harm to salmon.²⁶ In fact, sea water—where salmon and other fish spend most of their lives—contains a concentration of fluoride that is 80 percent higher than the level recommended for fluoridation.²⁷
- There is no evidence that fluoridated water has a negative effect on plants, gardens or lawns, or plants.²⁸ Research shows that even high levels of fluoride do not have a toxic effect on plants in ponds.²⁹

More examples of anti-fluoride groups misrepresenting the evidence:

- **The Fluoride Action Network (FAN)** cites the incidence of fluorosis in India and other nations to raise concern about water fluoridation, but FAN neglects to inform readers that the cause of this condition is *not* fluoridated water.³⁰ In fact, water fluoridation is virtually unheard of in India.³¹ The problem is that several regions of India have geological conditions that make the *natural* fluoride levels between four and 15 times higher than the level used to fluoridate water in the U.S.³² This important distinction explains why the director of India’s Institute of Public Health has publicly endorsed water fluoridation.³³
- **Citizens for Safe Drinking Water (NoFluoride.com)** has posted anti-fluoridation quotes on its website, claiming that these statements “are made by the top medical authorities ... based on the latest medical research.” But several of these quotes are more than 40 years old and, therefore, are *not* based on the latest research. The group cites a quote from an American Medical Association leader who was AMA’s president in the 1930s—many years before fluoridation was first tried in the U.S.³⁴ The American Medical Association has endorsed fluoridation as an effective public health strategy.³⁵
- **The New York State Coalition Opposed to Fluoridation (NYSCOF)** has described fluorosis as “fluoride-ruined teeth,” ignoring the fact that nearly all fluorosis in the U.S. is a mild, cosmetic condition that doesn’t affect the health or function of the teeth.³⁶ NYSCOF also cites bizarre case studies that have nothing to do with Americans drinking fluoridated water. For example:
 - In 2010, NYSCOF cited the case of a 53-year-old British woman in a Facebook post headlined: “Fluoride Damages Bones, Studies Show.” But unless people read the full article, they would never learn what a bizarre lifestyle this woman had—drinking six cups of high-fluoride “brick tea” and brushing her teeth 8-10 times each day.³⁷ Ordinary Americans do not drink that type of tea, and they do not brush their teeth every two hours they’re awake. Presenting this woman’s case as a reason to fear water fluoridation in the U.S. is misleading.³⁸
 - In 2009, NYSCOF posted a press statement in which its president said that “even water fluoridation will cause arthritic-like symptoms in susceptible individuals ...”³⁹ However, the group provided no evidence connecting fluoridated water to arthritis. One of the articles that the group cited to back up its arthritis claim was from a French medical journal. The article described a peculiar case study that has nothing to do with drinking fluoridated water. This French case study was about a woman who brushed her teeth 18 times a day and swallowed the toothpaste—consuming a tube of toothpaste every two days.⁴⁰ It’s irresponsible to attack water fluoridation with far-fetched examples like this.

Sources

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³ "CDA leads efforts to keep fluoride off Prop 65 list," California Dental Association, (October 2011), http://www.cda.org/about_cda/news_links/cda_leads_efforts_to_keep_fluoride_off_prop_65_list; a phone conversation by Pew Center on the States with Martha Sandy, a senior toxicologist for the Office of Environmental Health Hazard Assessment, State of California, October 27, 2011.

⁴ "Oral Health Topics: Fluorosis," American Dental Association, <http://www.ada.org/5576.aspx?currentTab=1>, accessed May 3, 2011; this view is reinforced by a 2002 study, which noted that the faint streaks on teeth that mild fluorosis causes are typically "not noticed by most people or, indeed, by the individual himself or herself." See: W.H. Bowen, "Fluorosis: Is it really a problem?" *Journal of the American Dental Association*, (October 2002), Vol. 133, 1406.

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⁹ "Using Fluoride to Prevent and Control Tooth Decay in the United States," U.S. Centers for Disease Control and Prevention, http://www.cdc.gov/fluoridation/fact_sheets/fl_caries.htm, accessed May 6, 2011.

¹⁰ For one example, see: "Skeletal Fluorosis: Recent Reports from India," Fluoride Action Network, <http://www.fluoridealert.org/fluorosis-india.htm>, accessed November 2, 2011.

¹¹ "Statement on FDA Toothpaste Warning Labels," American Dental Association, (July 19, 1997), <http://www.ada.org/1761.aspx>, accessed November 28, 2011.

¹² T. Marthaler, G. Gillespie and F. Goetzfried, "Salt fluoridation in Europe and in Latin America – with potential worldwide," *Wirtschaft*, (March 2011), 12-25, [http://www.eusalt.com/pages/press-corner/file.handler?f=111109%20-%20German%20Journal%20Kali%20und%20Steinsalz%20-%20Salt%20Fluoridation%20in%20Europe%20and%20Latin%20America%20\(Print%20Version\).pdf](http://www.eusalt.com/pages/press-corner/file.handler?f=111109%20-%20German%20Journal%20Kali%20und%20Steinsalz%20-%20Salt%20Fluoridation%20in%20Europe%20and%20Latin%20America%20(Print%20Version).pdf). (Note: "Wirtschaft" is a German publication, and this word means "business" in German.)

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¹⁴ "The extent of water fluoridation in the UK and worldwide," The British Fluoridation Society, http://www.bfsweb.org/facts/wf_uknworld/f_wf_uknworld.htm, accessed November 17, 2011; "The Results of Water Fluoridation in Ireland," *Journal of Public Health Dentistry*, (December 1996), Vol. 56, No. 5, 259-264, <http://onlinelibrary.wiley.com/doi/10.1111/j.1752-7325.1996.tb02449.x/abstract>; K.K. Cheng, I. Chalmers and T.A. Sheldon, "Adding fluoride to water supplies," *British Medical Journal*, (October 6, 2007), Vol. 335, 700.

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²⁰ For West Virginia’s and Connecticut’s 2009 poverty data, see: “State and County QuickFacts,” U.S. Census Bureau, <http://quickfacts.census.gov/qfd/index.html>.

²¹ J.V. Kumar, O. Adekugbe and T.A. Melnik, “Geographic Variation in Medicaid Claims for Dental Procedures in New York State: Role of Fluoridation Under Contemporary Conditions,” *Public Health Reports*, (September-October 2010) Vol. 125, No. 5, 647-54.

²² Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ,” Bazian, (February 11, 2009), 3.

²³ Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ,” Bazian, (February 11, 2009), 3-5.

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²⁵ H.F. Pollick, “Water Fluoridation and the Environment: Current Perspective in the United States,” *International Journal of Occupational and Environmental Health*, (2004), Vol. 10, 343-350, <http://www.cdc.gov/fluoridation/pdf/pollick.pdf>.

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²⁷ “Fluoride in Drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality,” World Health Organization, 2004, 2, http://www.who.int/water_sanitation_health/dwq/chemicals/fluoride.pdf, accessed on January 20, 2012.

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³⁰ “Skeletal Fluorosis: New Reports from India,” Fluoride Action Network, <http://www.fluoridealert.org/fluorosis-india.htm>, accessed November 2, 2011.

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Geographic Variation in Medicaid Claims for Dental Procedures in New York State: Role of Fluoridation Under Contemporary Conditions

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SYNOPSIS

Objective. We conducted an evaluation to determine if the number of claims reimbursed for caries-related procedures for children in the New York State Medicaid program varied by county fluoridation coverage.

Methods. We calculated the mean number of claims per recipient for children in each county separately for the treatment of caries and all other procedures not related to caries using the 2006 Medicaid claims data.

Results. Compared with the predominantly fluoridated counties, the mean number of restorative, endodontic, and extraction procedures per recipient was 33.4% higher in less fluoridated counties. The mean number of claims per child for caries-related services was inversely correlated with the extent of fluoridation in a county (Spearman's correlation coefficient = -0.54 , $p < 0.0001$), but claims for non-caries related services were not.

Conclusions. These findings, when added to the already existing weight of evidence, have implications for promoting policies at the federal and state levels to strengthen the fluoridation program.

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Community water fluoridation (CWF) is a classic example of a population-based strategy for controlling dental caries (tooth decay), a common chronic disease.¹ It focuses on environmental and policy changes instead of relying on changes in individual behavior, and reaches large segments of the population at a low cost. CWF not only incorporates fluoride into developing teeth, but it also frequently delivers low levels of fluoride to saliva. Furthermore, salivary and plaque fluoride concentrations are likely to be directly related to water fluoride concentrations among children.² The Centers for Disease Control and Prevention (CDC) estimates that for every dollar spent, CWF saves \$38 in treatment costs.³ In Colorado, fluoridation was associated with annual savings of \$148.9 million in 2003, or a mean of \$61 per person.⁴

Despite these obvious advantages, only 69.2% of the U.S. population served by community water systems received optimally fluoridated water in 2006. Only 25 states and the District of Columbia have met the U.S. Public Health Service *Healthy People 2010* goal of reaching 75% of the population on public water supplies.⁵ There are many reasons why other states have not met the objective. Laws for implementing CWF vary widely, with only 12 states and the District of Columbia mandating CWF on a statewide basis.⁶ In most states, CWF is enacted by a local body, either by ordinance or by a referendum. The concerns that are often raised during the discussions about fluoridation cover a broad range of issues including perceived risk and harm of adding fluoride to the water supply; lack of resources to purchase equipment and chemicals, which has substantially increased in recent years; quality and quantity of studies to demonstrate benefits and absence of risks; technical feasibility; the notion that caries is not a problem in the community; ideas speculating that fluoride's main mode of action is topical (hence, no need for systemic ingestion) or that alternative caries prevention programs are just as effective; and debate about individual freedom and community benefit.⁷⁻⁹

The Guide to Community Preventive Services found strong evidence for promoting and continuing community water fluoridation.¹⁰ However, some communities have not considered it or have questioned its continuation because the benefits are not easily discernable, and doubts about fluoride's safety, though unfounded, can easily be misleading when raised by opponents.¹¹⁻¹³ The finding that dental caries in children has declined in fluoridated and non-fluoridated areas makes it more challenging to argue for the continuation of fluoridation. Fluoride is now available from other sources such as toothpaste, tablets, and rinses, thus making it appear that fluoridation is unnecessary.¹⁴⁻¹⁶ Despite the

availability of these other sources of fluoride, two large national studies conducted during the 1980s in the U.S. reaffirmed the benefits of CWF.^{17,18} The National Children's Caries Survey showed that children living in fluoridated areas had 18% to 25% fewer carious lesions compared with those living in non-fluoridated areas.¹⁴ The National Preventive Dentistry Demonstration Program (NPDDP) also showed that CWF was the most cost-effective of various types of combinations of school-based preventive dental care procedures.^{14,17} However, such studies are unlikely to be repeated because it would be difficult to justify their cost given the already available weight of evidence regarding the safety, effectiveness, and cost savings of fluoridation. Therefore, researchers have used other resources, such as Medicaid claims data and economic models, to assess the impact of CWF on the cost of providing dental treatment.^{4,19,20}

Although numerous epidemiologic studies in New York State (NYS) have shown the safety and effectiveness of fluoridation in reducing caries, data on the impact of the fluoridation program on Medicaid claims could be more convincing to policy makers at the local level.^{15,21-25} Therefore, an evaluation was undertaken to determine if the number of claims reimbursed for specific caries-related services for children in the Medicaid program varied by county fluoridation coverage. The analysis assessed if the extent of fluoridation is correlated with the mean number of claims reimbursed for restorative, extraction, and endodontic procedures (caries-related services) performed under the Medicaid program to treat dental caries in the Early Periodic Screening, Diagnosis, and Treatment (EPSDT) program age range.

METHODS

Medicaid utilization and expenditure data

We obtained all of the reimbursed claims for dental procedures performed under the Medicaid program for 57 counties and New York City during the 2006 calendar year from the NYS Department of Health's Office of Health Insurance Programs. The analysis was limited to 606,125 children (unduplicated) younger than age 21 who had at least one claim for a dental procedure. For calculating the number of claims per child as an indicator, we selected the number of recipients as the denominator because it reflects the actual number of services delivered per child. Adults were excluded because of their uncertain residential history and the possibility of claims submitted for them for replacement of old fillings and for extractions due to conditions not related to caries. Children's current

residential history is more likely to reflect exposure to fluoridation. They are less likely to get replacement fillings, and tooth extractions in children are mainly to treat caries. Dental procedures were grouped by Current Dental Terminology (CDT) procedure codes, and categorized broadly into caries-related (e.g., extraction, endodontic, and restorative) and non-caries-related services (e.g., all other services).

County water fluoridation coverage

We determined fluoridation coverage for each county using the CDC-based Water Fluoridation Reporting System (WFRS), which provides information concerning the population receiving fluoridated water for each county.²⁶ The percentage of people receiving fluoridated water in each county was determined by dividing the number of residents on fluoridated water by the total population from the 2007 U.S. Census data.²⁷ Next, we categorized counties according to the percentage of the population on fluoridated water into three strata: less fluoridated ($\leq 30\%$), partially fluoridated (31%–69%), and predominantly fluoridated ($\geq 70\%$) to obtain two groups of counties with the least and greatest penetration of water fluoridation. We considered the NYS mean of 70% of the population on public water supplies receiving fluoridated water as predominantly fluoridated because we estimated that this is likely to be the maximum extent of fluoridation in most counties. Similarly, the opportunities for increasing the percentage covered by fluoridation are greatest in counties with fluoridation levels below 30%, which closely approximates to a tertile.

Demographic information

We obtained demographic information from the 2006 U.S. Census data, the 2006 KIDS COUNT Data Book, and the Kids' Well-being Indicators Clearinghouse (KWIC) to compare the characteristics of fluoridated and non-fluoridated counties.^{28–30} We merged these datasets and conducted analyses using SAS[®] version 9.1.³¹

Claims for dental procedures

We based the analysis on 787,067 claims for the treatment of caries (i.e., restorative, extraction, and endodontic procedures) and 1,094,332 claims for all other procedures not related to the treatment of caries. We excluded claims related to diagnostic and oral prophylactic services for calculating non-caries-related procedures, as these are also related to the treatment of caries. We calculated the mean number of claims per recipient in each county separately for the treatment of caries and all other procedures using the total

number of children who received a dental service as the denominator. We developed scatter plots to visualize the mean number of claims per recipient according to the fluoridation status of the county. Spearman's correlation coefficients were calculated to assess the relationship between the extent of fluoridation in a county and the mean number of claims. We also calculated the mean number of claims for the less fluoridated, partial, and predominantly fluoridated counties for three age groups.

We used a linear regression model to assess the effect of county fluoridation coverage on mean number of claims after controlling for county-level characteristics shown in Table 1. The model included county-level characteristics such as the percentage nonwhite, the percentage of children participating in the free or reduced school-lunch program, the percentage urban, and the number of dentists who submitted at least one claim per 100,000 Medicaid-eligible clients.

RESULTS

Table 1 shows the characteristics of the counties by fluoridation status, including selected demographic characteristics, the percentage of population groups receiving fluoridated water, Medicaid enrollees per provider, and the utilization rate of the counties by assigned fluoridation coverage status. We assigned New York City to a separate group because its demographic characteristics are different from the other counties. Demographic characteristics for the predominantly fluoridated counties and less fluoridated counties were comparable.

The mean numbers of claims for restorative, endodontic, and extraction procedures per recipient for less fluoridated, partially fluoridated, and predominantly fluoridated counties were 1.66, 1.33, and 1.23, respectively (Table 2). Compared with the predominantly fluoridated counties, the mean number of restorative, endodontic, and extraction procedures per recipient was 33.4% and 8.1% higher in less fluoridated and partially fluoridated counties, respectively. We consistently observed this difference in every age group. The Figure shows a scatter plot of claims for the mean number of restorative, endodontic, and extraction procedures per recipient. The results show that as the county fluoridation coverage increased, the mean number of claims per recipient decreased (Spearman's correlation coefficient = -0.54 , $p < 0.0001$). The dispersion of the data expressed as a coefficient of variation around the mean number of claims was larger in less fluoridated counties when compared with that in more fluoridated counties.

Table 1. Characteristics of New York State counties by fluoridation status, 2006

Characteristics	Fluoridated Upstate ($\geq 70\%$)	Fluoridated New York City (100%)	Non-fluoridated ($\leq 30\%$)	Mixed (30%–70%)
County (N)	10	1	31	16
Population (0–17) ^{a,b} (N)	956,085	2,002,150	1,381,965	428,013
Nonwhite ^b (percent)	19	55	14	8
Free/reduced lunch program ^{c,d} (percent)	37	80	26	38
Children <17 years of age living below poverty ^{c,d} (percent)	16	30	11	16
Total population receiving fluoridated water ^e (percent)	92	100	9	49
Urban ^b (percent)	88.3	100.0	79.5	52.9
Providers per 100,000 Medicaid-eligible enrollees ^f (N)	109.7	73.2	116.5	93.4
Utilization rate (percent) ^g	33.0	28.8	29.3	27.4

^aCensus Bureau (US). Table 1: annual estimates of the population for counties of New York: April 1, 2000, to July 1, 2007 (CO-EST2007-01-36) [cited 2008 Apr 20]. Available from: URL: <http://www.census.gov/popest/counties/tables/CO-EST2007-01-36.xls>

^bAuthors' calculation based on: Table 1, U.S. Census 2000 summary file 1, matrices P1, P2, P3, PCT12, and P13, Census 2000, U.S. Census Bureau [cited 2008 Apr 26]. Available from: URL: http://factfinder.census.gov/servlet/DatasetMainPageServlet?_ds_name=DEC_2000_SF1_U&program=DEC&lang=en

^cNew York State Council on Children and Families. Kids' Well-being Indicators Clearinghouse (KWIC) [cited 2008 Apr 30]. Available from: URL: <http://www.nyskwic.org>

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^eAuthors' calculation based on: Centers for Disease Control and Prevention (US). My water's fluoride [cited 2008 Apr 18]. Available from: URL: <http://apps.nccd.cdc.gov/MWF/Index.asp>

^fNumerator is the number of dentists who billed \geq \$1,000 in 2006.

^gReflects the percent of Medicaid enrollees with at least one claim

The mean number of claims per recipient for non-caries-related claims did not follow the same pattern as that for procedures performed for the treatment of caries. There was no correlation between county fluoridation coverage and mean claims per recipient for non-caries-related procedures (Spearman's correlation coefficient = -0.06909 , $p=0.6063$).

The regression analysis showed that for every 10% increase in the fluoridation status of a county, the number of claims per child for caries-related services declined by 0.06 ($p<0.01$) (Table 3). This equates to a difference of 60 claims per 100 children when the county's fluoridation status changes from zero to 100%.

DISCUSSION

The analysis of the data showed fewer claims per recipient for procedures related to caries in predominantly fluoridated counties compared with less fluoridated counties. The finding that claims for caries-related procedures, but not other dental procedures, were correlated with the fluoridation status of the county strengthens the contribution of fluoridation in explaining this geographic variation. It is highly unlikely that a systematic error favoring fluoridation has occurred

with respect to only caries-related procedures but not non-caries-related procedures. Furthermore, a finding of greater variation among less fluoridated areas is consistent with the effect of fluoridation in that while fluoridation reaches all segments of the population, other alternatives can have varying effects.

Based on the NYS Medicaid Fee Schedule, a single claim for a simple restoration on a permanent tooth costs \$55. It can range from \$43 to \$580, depending upon the procedure performed. Therefore, the mean cost of a simple restorative service per Medicaid recipient is estimated to be \$91.30 (1.66 claims \times \$55) and \$67.65 (1.23 claims \times \$55) in less fluoridated and predominantly fluoridated counties in NYS, respectively. The difference between these two groups in treatment costs per recipient (younger than 21 years of age) averaged \$23.63, assuming that all of them received a simple restoration. This is a conservative estimate, as claims for adjunctive services such as examinations; radiographs and complex treatments; and costs related to transportation, emergency room visits, and lost productivity are not included. Such annual decreases in claims per recipient when applied to lifetime exposure of the whole population have large societal benefits. This assumes greater importance for counties in NYS, as their share of Medicaid contribution is significantly

Table 2. Claims for restorative, endodontic, extraction, and other non-caries-related procedures by fluoridation status and age groups in counties in New York State: New York State Medicaid claims data, 2006

Age groups	Predominantly fluoridated counties (n=11)		Less fluoridated counties (n=31)		Partially fluoridated counties (n=16)	
<i>Claims for restorative procedures^a</i>						
Age group (in years)	N	Mean	N	Mean	N	Mean
0-3	20,974	0.62	6,685	0.89	2,184	0.92
4-13	237,071	0.81	70,119	1.18	20,461	0.90
14-20	177,193	1.19	37,665	1.43	10,896	0.99
0-20	435,238	0.91	114,469	1.23	33,541	0.93
<i>Claims for extraction procedures^a</i>						
Age group (in years)	N	Mean	N	Mean	N	Mean
0-3	3,390	0.10	1,346	0.18	554	0.23
4-13	80,394	0.27	18,444	0.31	6,401	0.28
14-20	24,080	0.16	6,585	0.25	3,338	0.30
0-20	107,864	0.23	26,375	0.28	10,293	0.28
<i>Claims for endodontic procedures^a</i>						
Age group (in years)	N	Mean	N	Mean	N	Mean
0-3	3,803	0.11	1,460	0.19	570	0.24
4-13	28,028	0.10	10,096	0.17	3,120	0.14
14-20	9,570	0.06	2,192	0.08	448	0.04
0-20	41,401	0.09	13,748	0.15	4,138	0.11
<i>Total claims for caries-related procedures (restorative, endodontic, and extraction)^a</i>						
Age group (in years)	N	Mean	N	Mean	N	Mean
All age groups (0-20)	584,503	1.23	154,592	1.66	47,972	1.33
<i>Claims for non-caries-related procedures^a</i>						
Age group (in years)	N	Mean	N	Mean	N	Mean
0-3	32,719	0.96	8,076	1.07	1,693	0.71
4-13	574,614	1.96	103,619	1.74	33,193	1.45
14-20	282,751	1.89	42,334	1.60	15,333	1.40

^aN represents the number of claims and mean represents the average number of claims per recipient.

reduced. These results are consistent with the studies conducted in Louisiana and Texas, which found that substantial savings in public programs were associated with CWF programs. In Louisiana, the difference in treatment costs per Medicaid-eligible child residing in fluoridated parishes compared with those residing in non-fluoridated parishes ranged from \$14.68 for one-year-olds to \$58.91 for 3-year-olds. The mean difference in treatment costs per eligible preschooler was \$36.28.¹⁹ In the Texas Health Steps (EPSDT-Medicaid) program, the mean dental treatment cost per child decreased by \$24 for a unit increase in fluoridation level (0.0 milligrams/liter fluoride (mg/L F) to 1.0 mg/L F).²⁰

Implications

These findings have implications for promoting policies at the federal and state levels to strengthen the fluoridation program. Recently, many communities have considered discontinuation of water fluoridation due

to the increased cost of chemicals. Basically, the savings associated with fluoridation are not linked to the costs carried by the community water supplier. Therefore, policy initiatives that provide more direct links between fluoridation costs and benefits may be attractive. Such initiatives may include subsidies for water system infrastructure and chemical costs. Initiatives that involve disincentives and incentives for communities and insurance programs could be explored.³²

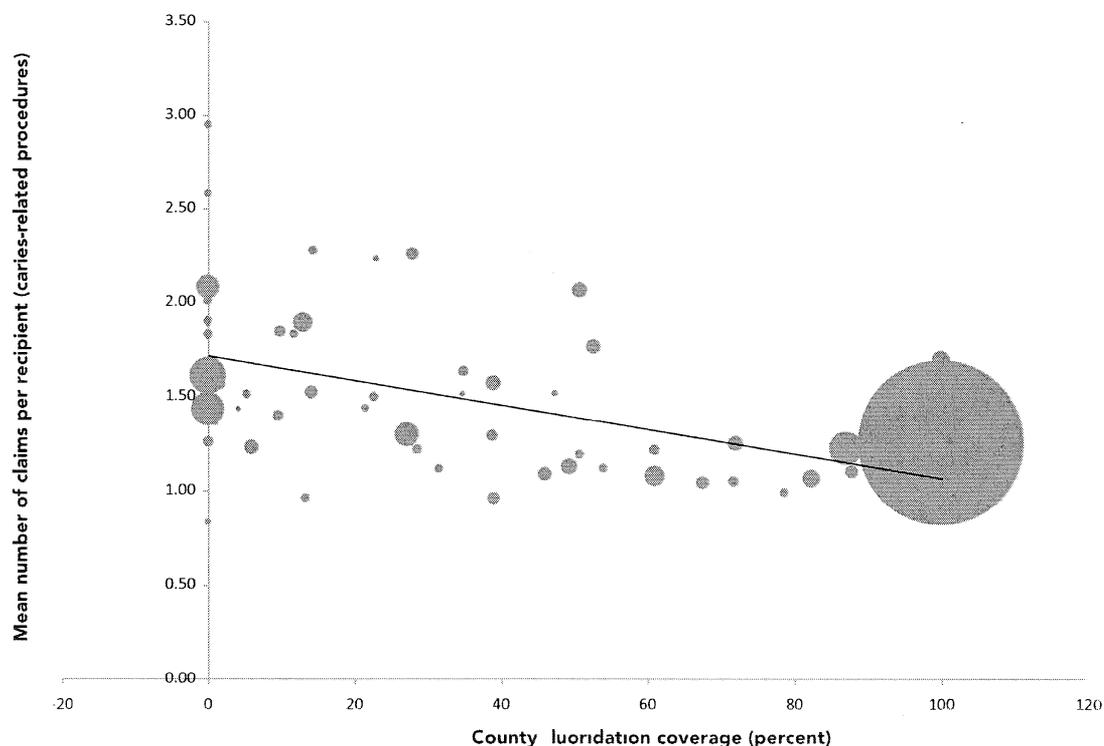
Limitations and considerations of alternative explanations

This study was subject to several limitations. An evaluation study such as this could be undertaken only in states where there is wide geographic variation in population coverage by fluoridation. Although approximately 12 million NYS residents receive fluoridated water, only about 40% of residents outside New York City live in fluoridated communities. Therefore, populations were available to assess the impact. However, measuring the

impact of fluoridation to control dental caries is difficult because it is characterized by a complex interaction of multiple risk factors. Epidemiologic studies require follow-up of individuals for a long period of time and careful documentation of exposure to fluoridation, and other sources of fluoride, at the individual level. Furthermore, the diffusion of fluoride-added drinking water to non-fluoridated areas via processed beverages dilutes the effects.³³ The cost of undertaking an evaluation of such a proven population-based intervention can be enormous and, thus, difficult to justify. It is even more challenging to design such evaluation studies because fluoridated and non-fluoridated communities may be inherently different with respect to known and unknown variables. Communities decide to adopt fluoridation because of high levels of dental caries. However, an indirect assessment by limiting the analysis to the Medicaid population may be more valid because to some extent, the eligibility for Medicaid is based on uniform criteria and, therefore, this population is more homogeneous than the general population.

Many factors influence geographic variation in the mean number of claims for caries-related procedures, such as enrollment rates in Medicaid, disease occurrence, availability of dentists, and subsequent treatment. Therefore, one should be cautious in attributing this geographic variation solely to water fluoridation. Furthermore, the availability of fluoride in beverages and fluoride provided through organized programs, which distribute tablets and rinses in non-fluoridated communities, may underestimate the effect of fluoridation. A survey of third-grade children in less fluoridated communities in NYS showed that reportedly 20% to 80% of children had received fluoride tablets on a regular basis.³⁴ About 100,000 school-aged children in non-fluoridated areas are targeted for participation in a weekly fluoride rinse program. In addition, toothpaste and processed beverages are the other sources of fluoride. Programs such as school-based sealant programs are also available in these areas. Therefore, the observation of an effect in fluoridated counties is impressive.

Figure. Mean number of claims per recipient for restorative, endodontic, and extraction procedures in 0- to 20-year-olds by county and fluoridation status: New York State Medicaid claims data, 2006



Note: Each data point reflects the relative size of the eligible population. The coefficient of variation was 27.2%, 23.4%, and 18.3%, respectively, for $\leq 30\%$, 30%–69%, and $\geq 70\%$ county fluoridation coverage.

Table 3. Regression analysis of claims for restorative, extraction, and endodontic procedures per child: New York State Medicaid claims data, 2006^a

Variable	Parameter estimate	Standard error	P-value
Intercept	1.881	0.328	<0.0001
Fluoridation coverage (percent) ^b	-0.060	0.002	0.003
Children on free or reduced school-lunch program (percent)	-0.007	0.006	0.271
Population nonwhite (percent)	0.012	0.009	0.190
Urban population (percent)	-0.003	0.004	0.355
Number of providers per 100,000 eligible Medicaid enrollees	0.001	0.001	0.303

^aUnit of analysis is county (n=58); r²=0.2817.

^bEstimated decrease in the mean number of claims per child is based on a 10% increase in fluoridation coverage of a county. An increase from 0% to 100% in fluoridation equates to a decline of 0.6 claims per child.

A limitation of this study was the use of Medicaid administrative data, for which the accuracy of reporting of claims is unknown. There are three different reimbursement methods in the NYS Medicaid program, which could have led to under- or overreporting of claims. However, there is no reason to believe that the reporting is associated with the fluoridation status of a county. We measured the exposure to fluoridation at the ecologic level, and covariates at the individual level were not available to control for confounding.

The length or magnitude of the children's exposure to fluoridation and other sources of fluoride were not available and, therefore, a comparison made between more and less fluoridated counties could lead to misclassification of children with respect to exposure. Also, we did not have data to verify that the water systems maintained fluoride concentrations at the optimal level. In addition, the extent of the use of other preventive measures is unknown. Furthermore, only aggregate-level claims at the county level were available. Nevertheless, one can examine alternative explanations for the geographic variation. First, utilization of services can vary depending upon the availability of dentists. However, the overall utilization among these predominantly fluoridated and less fluoridated counties was largely similar (33% vs. 29%). Second, dental caries is cumulative and, therefore, age of children can affect service utilization and the mix of services (Table 2). In this study, there were consistently fewer claims for caries-related procedures in every age group. Finally, dental sealants are also effective in preventing dental caries, but fewer than 8% of all children in the Medicaid program receive sealants. Furthermore, the difference in claims was observed even in the youngest age group who do not receive sealants.

In general, ecologic studies only provide weak evidence for establishing causal relationships. Therefore, to establish causality, these types of studies must be

followed by more rigorous, analytical approaches. We justify the use of an ecologic design for this analysis because it is used as an evaluation method to monitor the benefits of a proven population-based intervention. The effectiveness, safety, and cost savings of fluoridation have been demonstrated, and the biological mechanism of fluoride action is established. Furthermore, we explored alternative explanations, such as the availability of dentists, age distribution, service mix, urban-rural nature, and poverty level of the county.

Although the use of Medicaid administrative data is a limitation of this study, there are several advantages: these data are readily available, this study is based on the whole population rather than a sample, and the number of children receiving the benefits is large. As it stands, this analysis of children enrolled in the Medicaid program serves as a surveillance study of the fluoridation program.

CONCLUSIONS

We found that the mean number of claims for caries-related services for children in the NYS Medicaid program was correlated with the extent of fluoridation in a county. These annual decreases in claims per recipient, when applied to lifetime exposure of the whole population, have large societal benefits. These findings, added to the already existing weight of evidence, have implications for promoting policies at the federal and state levels to strengthen the fluoridation program.

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Community Water Fluoridation



"...one of ten great public health achievements of the twentieth century."¹



Fluoridation in New York State: A Fact Sheet

Costs and Savings

Studies continue to show that community water fluoridation prevents cavities and saves money, both for families and the health care system.

- Cost of fluoridation depends on the size of the community and the amount of fluoride added to the water supply. In one study, the median cost per person per year ranged from \$2.70 among 19 systems serving <5000 people to \$0.40 among 35 systems serving $\geq 20,000$ people.¹
- The results of the National Preventive Dentistry Demonstration Program study found that water fluoridation was the most cost effective means of reducing tooth decay in children. It prevented as much tooth decay as a dental sealant program. In contrast to the \$23 per year cost of maintaining a child in a sealant program, the annual per capita cost (in 1981 dollars) of water fluoridation in five United States communities ranged from \$0.06 in Denver, Colorado to \$0.80 in rural West Virginia.²
- Fluoride tablets and drops, rinses and toothpastes, are more expensive and less effective than the fluoridation of drinking water.³
- Every dollar spent on fluoridation on average saves \$38 in avoided dental bills. Over a lifetime the cost of fluoridation is typically less than the cost of one dental filling.⁴
- The difference in treatment costs per Medicaid-eligible child residing in parishes in Louisiana with community water fluoridation (F) compared with those residing in parishes without fluoridation (NF) ranged from \$14.68 for 1-year-olds to \$58.91 for 3-year-olds; at all ages, costs were higher in NF than in F parishes. In 1995-1996, the mean difference in treatment costs per eligible preschooler was \$36.28 (95% confidence interval=\$9.69-\$62.87).⁵
- A study found that the annual savings associated with fluoridation in Colorado was \$148.9 million (credible range, \$115.1 million to \$187.2 million) in 2003, or an average of \$60.78 per person (credible range, \$46.97 to \$76.41).⁶
- Recently, an increase in the cost of fluoride chemicals has been reported. It still costs much less to fluoridate, when compared to the costs for dental fillings for a single tooth over a lifetime because the cost of fillings has also increased. This is further compounded, by the need to restore and maintain fillings. On an average, fillings are expected to last about 12 years.

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Community Water Fluoridation



"...one of ten great public health achievements of the twentieth century."¹



Oral Health in New York State: A Fact Sheet

Benefits

Why is oral health a public health issue?

Oral health is integral to general health.² Although preventable, tooth decay is a chronic disease affecting all age groups. In fact, tooth decay is the most common chronic disease of childhood.² It is a greater problem for those who have limited access to prevention and treatment services. Left untreated, tooth decay can cause pain and tooth loss. Infection originating from teeth can lead to abscesses and spread to distant sites of the body like the brain. Among children, untreated decay has been associated with difficulty in eating, sleeping, learning, and proper nutrition.² An estimated 51 million school hours are lost due to cavities. Almost one fifth of all health care expenditures in children are related to dental care.² Among adults, untreated decay and tooth loss can also have negative effects on an individual's self-esteem and employability.

In the U.S., tooth decay⁴ affects:

- ✓ 1 in 4 children aged 2-5
- ✓ 1 in 2 school children
- ✓ 2 of 3 adolescents
- ✓ 9 of 10 adults

Tooth decay may lead to:

- ✓ Abscess and extreme pain
- ✓ Blood infection that can spread
- ✓ Difficulty in chewing
- ✓ Poor weight gain
- ✓ School absences
- ✓ Crooked teeth

What are the benefits of fluoridation?

Fluoride added to community drinking water to reach a concentration of 0.7 to 1.2 parts per million (0.7 to 1.2 milligrams per liter of water) has repeatedly been shown to be an effective method of preventing tooth decay.³ Because community water fluoridation benefits everyone in the community, regardless of age and socioeconomic status, fluoridation provides protection against tooth decay in populations with limited access to prevention and treatment services. The Task Force on Community Preventive Services, a national independent, nonfederal, multidisciplinary task force appointed by the Centers for Disease Control and Prevention (CDC), conducted a systematic review of studies of community water fluoridation. They found that, in communities that initiated fluoridation, the decrease in childhood tooth decay was almost 30% over 3–12 years of follow-up.³ Stopping fluoridation was associated with an increase in tooth decay.

Is New York State reaching its Healthy People 2010 objectives?

Healthy People 2010 is a statement of national health objectives designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats. It is designed to achieve two overarching goals: (1) increase quality and years of healthy life and (2) eliminate health disparities among different segments of the population. Because of the effectiveness of water fluoridation in preventing tooth decay, the Healthy People program has objectives specific to water

fluoridation.⁵ Listed below are three of those related objectives and the status in New York State regarding each objective.

Objective 1: Increase the percentage of persons on public water receiving fluoridated water to 75%.
Status: New York State is near this objective as 70% of the population on public water receives fluoridated water.

Objective 2: Reduce the percentage of adults 65+ (65 years and older) who have lost all their teeth to 20%.

Status: New York State has reached this objective as only about 17% percent of New York State's 65+ population had lost all of their permanent teeth.⁴

Objective 3: Reduce the percentage of 3rd grade children with tooth decay to 42%.

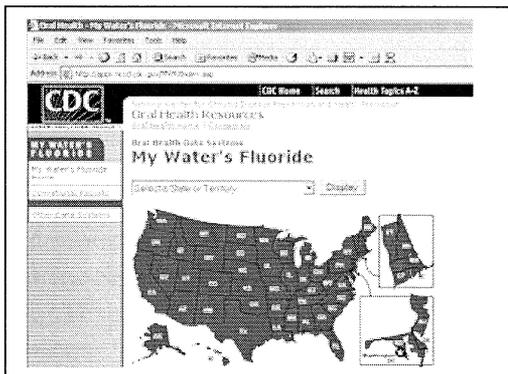
Status: New York State has to make progress to reach this objective as approximately 54% of 3rd grade children had experienced tooth decay.⁶ Furthermore, the disparity between higher and lower income children are noticeable.

How can the public know if a community water system is fluoridated?

Fluoride information is included in the annual water quality report that is sent to all consumers. This information can also be found at the Centers for Disease Control and Prevention's web page called **My Water's Fluoride**. The web address is: <http://apps.nccd.cdc.gov/MWF/Index.asp> or go to <http://www.cdc.gov/> Click on Health Promotion, Oral Health, then My Water's Fluoride.

The web page displays a map of the U.S. Just click on New York State, then the county and locate the water supply by name. Information that is available:

Water System Name
PWS ID #
Population Served
Water Source
Is it Fluoridated?
Optimal Fluoride Concentration
Date Fluoridation Started
Contact Information



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MYTHS & FACTS

Responses to common anti-fluoride claims

For more information, go to iLikeMyTeeth.org

THE TRUTH

Fluoride occurs naturally in water, though rarely at the optimal level to protect teeth.

OPPONENT'S CLAIM

"Fluoride doesn't belong in drinking water."

THE FACTS

- It's already there. Fluoride exists naturally in virtually all water supplies and even in various brands of bottled water. If the people making this statement truly believed it, they would no longer drink water or grape juice — or eat shellfish, meat, cheese or other foods that contain trace levels of fluoride.
- What's at issue is the amount of fluoride in water. There are proven benefits for public health that come from having the optimal level of fluoride in the water — just enough to protect our teeth. In 2011, federal health officials offered a new recommended optimal level for water fluoridation: 0.7 parts per million. That's our goal: getting just enough to help all of us keep our teeth longer.
- Fluoride is not a medication. It is a mineral, and when present at the right level, fluoride in drinking water has two beneficial effects: preventing tooth decay and contributing to healthy bones.
- U.S. court decisions have rejected the argument that fluoride is a "medication" that should not be allowed in water. The American Journal of Public Health summarized one of these rulings, noting that "fluoride is not a medication, but rather a nutrient found naturally in some areas but deficient in others."
- There are several examples of how everyday products are fortified to enhance the health of Americans — iodine is added to salt, folic acid is added to breads and cereals, and Vitamin D is added to milk.
- A community that stops fluoridating or never starts this process will find that local residents end up spending *more* money on decay-related dental problems. Evidence shows that for most cities, every \$1 invested in fluoridation saves \$38 in unnecessary treatment costs.
- A Texas study confirmed that the state saved \$24 per child, per year in Medicaid expenditures because of the cavities that were prevented by drinking fluoridated water.
- A Colorado study showed that water fluoridation saved the state nearly \$149 million by avoiding unnecessary treatment costs. The study found that the average savings were roughly \$61 per person.

Numerous scientific studies and reviews have recognized fluoride as an important nutrient for strong healthy teeth.

"Adding fluoride is like forcing people to take medication"

Fluoridation is one of the most cost-effective health strategies ever devised.

"Our city council can save money by ending fluoridation of our water system."

THE TRUTH

Fluoridation is a public health measure where a modest community-wide investment benefits everyone.

OPPONENT'S CLAIM

"Fluoridation is a 'freedom of choice' issue. People should choose when or if they have fluoride in their water."

Fluoridated water is the best way to protect everyone's teeth from decay.

"We already can get fluoride in toothpaste, so we don't need it in our drinking water."

Very high fluoride concentrations can lead to a condition called fluorosis.

"Fluoridation causes fluorosis, and fluorosis can make teeth brown and pitted."

Nearly all fluorosis in the U.S. is mild. This condition does not cause pain, and does not affect the health or function of the teeth.

and
"One-third of all children now have dental fluorosis."

THE FACTS

- Fluoride exists naturally in virtually all water supplies, so it isn't a question of choosing to get fluoride. The only question is whether people receive the optimal level that's documented to prevent tooth decay.
- It is completely unrealistic to make water fluoridation a person-by-person or household-by-household choice. The cost efficiency comes from a public water system fluoridating its entire supply.
- Maintaining an optimal amount of fluoride in water is based on the principle that decisions about public health should be based on what is healthy for the entire community, not based on a handful of individuals whose extreme fears are not backed by the scientific evidence.
- Fluoridation is not a local issue. Every taxpayer in a state pays the price for the dental problems that result from tooth decay. A New York study found that Medicaid enrollees in counties where fluoridation was rare needed 33% more fillings, root canals, and extractions than those in counties where fluoridated water was much more prevalent.
- The benefits from water fluoridation build on those from fluoride in toothpaste. Studies conducted in communities that fluoridated water in the years after fluoride toothpastes were common have shown a lower rate of tooth decay than communities without fluoridated water.
- The CDC reviewed this question in January 2011. After looking at all the ways we might get fluoride — including fluoride toothpaste — the CDC recommended that communities fluoridate water at 0.7 parts per million. Any less than that puts the health of our teeth at risk.
- Fluoride toothpaste alone is insufficient, which is why pediatricians and dentists often prescribe fluoride tablets to children living in non-fluoridated areas.
- Nearly all cases of fluorosis are mild — faint, white specks on teeth — that are usually so subtle that only a dentist will notice this condition. Mild fluorosis does not cause pain, and it does not affect the health or function of the teeth.
- The pictures of dark pitted teeth that anti-fluoride opponents circulate show severe cases of fluorosis, a condition that is almost unheard of in the U.S. Many of these photos are from India, and the reason is *natural* fluoride levels over there that are dramatically higher than the level used in the U.S. to fluoridate public water systems. Common sense shows how misleading these photos are. Think about it: Do one-third of the children's teeth you see look brown and pitted? No, they don't.
- In 2011, the CDC proposed a new level for fluoridation — 0.7 parts per million — that is expected to reduce the likelihood of fluorosis while continuing to protect teeth from decay.

THE TRUTH

OPPONENT'S CLAIM

THE FACTS

Getting enough fluoride in childhood will determine the strength of our teeth over our entire lifetime.

"Fluoride is especially toxic for small children."

- According to the American Academy of Pediatrics optimal exposure to fluoride is important to infants and children. The use of fluoride for the prevention and control of cavities is documented to be both safe and effective.
- Medical experts disagree with opponents' "toxic" claim. In fact, the American Academy of Family Physicians recommends that parents consider using dietary fluoride supplements for children at risk of tooth decay from ages 6 months through age 16 if their water isn't fluoridated.
- Children who drink fluoridated water as their teeth grow will have stronger, more decay resistant teeth over their lifetime. A 2010 study confirmed that the fluoridated water consumed as a young child makes the loss of teeth (due to decay) less likely 40 or 50 years later when that child is a middle-aged adult.

Children who swallow toothpaste are at increased risk of mild fluorosis.

"There's a warning label on fluoride toothpaste that tells you to 'keep out of reach of children', so fluoride in water must also be a danger."

- The warning label simply reflects the fact that toothpaste contains roughly 1,000 times as much fluoride per milligram as fluoridated water. Even so, the American Dental Association (ADA) believes the warning label on toothpaste exaggerates the potential for negative health effects from swallowing toothpaste. The ADA has stated that "a child could not absorb enough fluoride from toothpaste to cause a serious problem" and noted that fluoride toothpaste has an "excellent safety record."

Fluoridated water is safe for babies and young children.

"Fluoridated water isn't safe to use for babies."

- Many vitamin labels have similar statements: "Keep out of reach of children." That's because almost anything has the potential for negative health effects if it's left in the hands of unsupervised, young children.
- The evidence does not support what anti-fluoride groups say. The American Dental Association concludes that "it is safe to use fluoridated water to mix infant formula" and encourages parents to discuss any questions they may have with their dentists and pediatricians.
- Although using fluoridated water to prepare infant formula might increase the chance that a child develops dental fluorosis, nearly all instances of fluorosis are a mild, cosmetic condition. Fluorosis nearly always appears as very faint white streaks on teeth. The effect is usually so subtle that only a dentist would notice it during an examination. Mild fluorosis does not cause pain, nor does it affect the function or health of the teeth.
- A 2010 study examined the issue of fluorosis and infant formula, and reached the conclusion that "no general recommendations to avoid use of fluoridated water in reconstituting infant formula are warranted." The researchers examined the condition's impact on children and concluded that "the effect of mild fluorosis was not adverse and could even be favorable."

THE TRUTH

Although Americans' teeth are healthier than they were several decades ago, many people still suffer from decay — and the overall impact it has on their lives.

OPPONENT'S CLAIM

"Tooth decay is no longer a problem in the United States."

THE FACTS

- Tooth decay is the most common chronic health problem affecting children in the U.S. It is five times more common than asthma. Tooth decay causes problems that often last long into adulthood — affecting kids' ability to sleep, speak, learn and grow into happy and healthy adults.
- California children missed 874,000 school days in 2007 due to toothaches or other dental problems. A study of seven Minneapolis-St. Paul hospitals showed that patients made over 10,000 trips to the emergency room because of dental health issues, costing more than \$4.7 million.
- Poor dental health worsens a person's future job prospects. A 2008 study showed that people who are missing front teeth are viewed as less intelligent and less desirable by employers.
- In a 2008 study of the armed forces, 52% of new recruits were categorized as Class 3 in "dental readiness" — meaning they had oral health problems that needed urgent attention and would delay overseas deployment.
- The American Academy of Family Physicians, the Institute of Medicine and many other respected authorities endorse water fluoridation as safe. The Centers for Disease Control and Prevention reports that "panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective."
- More than 3,200 studies or reports had been published on the subject of fluoridation. Even after all of this research, the best that anti-fluoride groups can do is to claim that fluoride *could* cause or *may* cause one harm or another. They can't go beyond speculating because the evidence simply doesn't back up their fears.
- The cancer claim is part of a pattern. According to the American Council on Science and Health, "Historically, anti-fluoride activists have claimed, with no evidence, that fluoridation causes everything from cancer to mental disease."
- A 2011 Harvard study found no link between fluoride and bone cancer. This study reviewed hundreds of bone samples, and the study's design was approved by the National Cancer Institute. The study is significant because the National Research Council reported that *if* there were any type of cancer that fluoride might possibly be linked to, it would probably be bone cancer (because fluoride is drawn to bones). The fact that this Harvard study found no link to bone cancer strengthens confidence that fluoride is unlikely to cause any form of cancer.
- Opponents usually cite a 2006 study when they raise the cancer issue, but they omit the fact that the author of this study called it "an exploratory analysis." Instead of measuring the actual fluoride level in bone, this 2006 study relied on estimates of fluoride exposures that could not be confirmed, which undermines the reliability of the data.

THE TRUTH

Dozens of studies and more than 60 years of experience have repeatedly shown that fluoridation reduces tooth decay.

OPPONENT'S CLAIM

"Fluoridation doesn't reduce tooth decay."

THE FACTS

- An independent panel of 15 experts from the fields of science and public health reviewed numerous studies and concluded that fluoridation reduces tooth decay by 29%.
- An analysis of two similarly sized, adjacent communities in Arkansas showed that residents without access to fluoridated water had twice as many cavities as those with access to fluoridated water.
- In New York, Medicaid recipients in less fluoridated counties required 33% more treatments for tooth decay than those in counties where fluoridated water was prevalent.
- The benefits of fluoridation are long-lasting. A recent study found young children who consumed fluoridated water were still benefiting from this as adults in their 40s or 50s.
- The Centers for Disease Control and Prevention recognizes fluoridation's effectiveness in preventing tooth decay and cited fluoridated drinking water as one of the "10 great public health achievements of the 20th century."
- The European Archives of Pediatric Dentistry published an analysis of 59 studies that concluded that "water fluoridation is effective at reducing [decay] in children and adults."
- Europe has used a variety of programs to provide fluoride's benefits to the public. Water fluoridation is one of these programs. Fluoridated water reaches 12 million Europeans, mostly residents of Great Britain, Ireland and Spain. Fluoridated milk programs reach millions of additional Europeans, mostly in Eastern Europe.
- Salt fluoridation is the most widely used approach in Europe. In fact, at least 70 million Europeans consume fluoridated salt, and this method of fluoridation reaches most of the population in Germany and Switzerland. These two countries have among the lowest rates of tooth decay in all of Europe.
- Italy has not tried to create a national system of water fluoridation, but the main reasons are cultural and geological. First, many Italians regularly drink bottled water. Second, a number of areas in Italy have water supplies with natural fluoride levels that *already* reach the optimal level that prevents decay.
- Technical challenges are a major reason why fluoridated water isn't widespread in Europe. In France and Switzerland, for example, water fluoridation is logistically difficult because of the terrain and because there are tens of thousands of separate sources for drinking water. This is why Western Europe relies more on salt fluoridation, fluoride rinse programs and other means to get fluoride to the public.

Millions of people living in Europe are receiving the benefits of fluoride.

"European countries have rejected fluoridation, so why should we fluoridate water?"

THE TRUTH

Community water fluoridation is proven to reduce decay, but it isn't the only factor that affects the rate of tooth decay.

OPPONENT'S CLAIM

"There are states with a high rate of water fluoridation that have higher decay rates than states where water fluoridation is less common."

THE FACTS

- Water fluoridation plays a critical role in decay prevention, but other factors also influence decay rates. Researchers often call these factors as "confounding factors." Someone who ignores confounding factors is violating a key scientific principle. A person's income level is a confounding factor in tooth decay because low-income Americans are more at risk for decay than upper-income people. This makes sense because income status shapes how often a person visits a dentist, their diet and nutrition, and other factors.
- Comparing different states based solely on fluoridation rates ignores key income differences. For example, West Virginia and Connecticut reach roughly the same percentage of their residents with fluoridated water — 91 percent and 90 percent, respectively. Yet the percentage of West Virginians living below the poverty line is nearly double the percentage of those living in Connecticut. West Virginians are also more likely to get their drinking water from wells, which are not fluoridated to the optimal level.
- It's misleading to compare states without considering other, confounding factors. A much more reliable approach is to compare residents of the same state who share similar traits, such as income levels. A 2010 study of New York counties did just this and found that people living in areas with fluoridated water needed fewer fillings and other corrective dental treatments.
- A 2003 study of fluoridation in Colorado concluded that "even in the current situation of widespread use of fluoride toothpaste," water fluoridation "remains effective and cost saving" at preventing cavities.
- Studies conducted in communities that fluoridated water in the years after fluoride toothpastes were widely used have shown a lower rate of tooth decay than communities without fluoridated water.
- The co-author of a 2010 study stated that research confirms the "the most effective source of fluoride to be water fluoridation."
- Water fluoridation is inexpensive to maintain and saves money down the road. The typical cost of fluoridating a local water system is between 40 cents and \$2.70 per person, per year — less than the cost of medium-sized latte from Starbucks.
- For low-income individuals who are at higher risk of dental problems, fluoride rinses are a costly expense, which is why these products are not the "easy" answer that opponents of fluoridation claim they are.

Community water fluoridation is the most cost-effective way to protect oral health.

"There are better ways of delivering fluoride than adding it to water."

THE TRUTH

Water fluoridation has been one of the most thoroughly studied subjects, and the evidence shows it is safe and effective.

Anti-fluoride groups cite many "studies" that were poorly designed, gathered unreliable data, and were not peer-reviewed by independent scientists.

Much of the fluoride used to fluoridate public water systems is extracted from phosphate rock.

OPPONENT'S CLAIM

"The National Research Council's 2006 report said that fluoride can have harmful effects."

"Studies show that fluoride is linked to lower IQ scores in children."

"Fluoride is a by-product from the phosphate fertilizer industry."

THE FACTS

- The NRC raised the possibility of health concerns about areas of the U.S. where the *natural*/fluoride levels in well water or aquifers are unusually high. These natural fluoride levels are two to four times higher than the level used to fluoridate public water systems.
- The National Research Council itself explained that its report was not an evaluation of the safety of water fluoridation.
- The Centers for Disease Control and Prevention reviewed the NRC report and stated, "The report addresses the safety of high levels of fluoride in water that occur naturally, and does not question the use of lower levels of fluoride to prevent tooth decay."
- The foreign studies that anti-fluoride activists cite involved fluoride levels that were at least double or triple the level used to fluoridate drinking water in the U.S. It is irresponsible to claim these studies have any real meaning for our situation in the U.S.
- British researchers who evaluated these studies from China and other countries found "basic errors." These researchers pointed out that the lower IQs could be traced to other factors, such as arsenic exposure, the burning of high-fluoride coal inside homes and the eating of contaminated grain.
- Much of the fluoride used to fluoridate water is extracted from phosphate rock, and so is phosphoric acid—an ingredient in Coke and Pepsi. After fluoride is extracted from phosphate rock, much of that rock is later used to create fertilizers that will enrich soil. Opponents use this message a lot, maybe because they want to create the false impression that fluoride comes from fertilizer.
- Corn produces several useful by-products, including corn oil, cornstarch and corn syrup. Fluoride is one example of many by-products that help to improve the quality of life or health.

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March 22, 2013

Dr. Myron Allukian, Jr.
Immediate Past President, American Association for Community Dental Programs
Associate Clinical Professor, Harvard School of Dental Medicine
Via email: myalluk@aol.com

Dear Dr. Allukian:

As Deans of Harvard Medical School, Harvard School of Dental Medicine and the Harvard School of Public Health, we continue to support community water fluoridation as an effective and safe public health measure for people of all ages.

Numerous reputable studies over the years have consistently demonstrated that community water fluoridation is safe, effective, and practical. Fluoridation has made an enormous impact on improving the oral health of the American people.

Our country is fortunate to have over 204 million Americans living in fluoridated communities and having access to the health and economic benefits of this vital public health measure.

Sincerely,

Jeffrey S. Flier, MD
Dean of the Faculty of Medicine
Caroline Shields Walker Professor of Medicine
Harvard Medical School

R. Bruce Donoff, DMD, MD
Dean and Walter C. Guralnick Distinguished Professor of Oral and Maxillofacial Surgery
Harvard School of Dental Medicine

Julio Frenk, MD, MPH, PhD
Dean of the Faculty, Harvard School of Public Health
T & G Angelopoulos Professor of Public Health and International Development,
Harvard School of Public Health and Harvard Kennedy School

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FOR IMMEDIATE RELEASE
January 7, 2011Contact: OASH ashmedia@hhs.gov 202-205-0143
EPA isa.joh@epa.gov or 202-564-3226**HHS and EPA announce new scientific assessments and actions on fluoride***Agencies working together to maintain benefits of preventing tooth decay while preventing excessive exposure*

WASHINGTON – The U.S. Department of Health and Human Services (HHS) and the U.S. Environmental Protection Agency (EPA) today are announcing important steps to ensure that standards and guidelines on fluoride in drinking water continue to provide the maximum protection to the American people to support good dental health, especially in children. HHS is proposing that the recommended level of fluoride in drinking water can be set at the lowest end of the current optimal range to prevent tooth decay, and EPA is initiating review of the maximum amount of fluoride allowed in drinking water.

These actions will maximize the health benefits of water fluoridation, an important tool in the prevention of tooth decay while reducing the possibility of children receiving too much fluoride. The Centers for Disease Control and Prevention named the fluoridation of drinking water one of the ten great public health achievements of the 20th century.

"One of water fluoridation's biggest advantages is that it benefits all residents of a community—at home, work, school, or play," said HHS Assistant Secretary for Health Howard K. Koh, MD, MPH. "Today's announcement is part of our ongoing support of appropriate fluoridation for community water systems, and its effectiveness in preventing tooth decay throughout one's lifetime."

"Today both HHS and EPA are making announcements on fluoride based on the most up to date scientific data," said EPA Assistant Administrator for the Office of Water, Peter Silva. "EPA's new analysis will help us make sure that people benefit from tooth decay prevention while at the same time avoiding the unwanted health effects from too much fluoride."

HHS and EPA reached an understanding of the latest science on fluoride and its effect on tooth decay prevention and the development of dental fluorosis that may occur with excess fluoride consumption during the tooth forming years, age 8 and younger. Dental fluorosis in the United States appears mostly in the very mild or mild form – as barely visible lazy white markings or spots on the enamel. The severe form of dental fluorosis, with staining and pitting of the tooth surface, is rare in the United States.

There are several reasons for the changes seen over time, including that Americans have access to more sources of fluoride than they did when water fluoridation was first introduced in the United States in the 1940s. Water is now one of several sources of fluoride. Other common sources include dental products such as toothpaste and mouth rinses, prescription fluoride supplements, and fluoride applied by dental professionals. Water fluoridation and fluoride toothpaste are largely responsible for the significant decline in tooth decay in the U.S. over the past several decades.

HHS' proposed recommendation of 0.7 milligrams of fluoride per liter of water replaces the current recommended range of 0.7 to 1.2 milligrams. This updated recommendation is based on recent EPA and HHS scientific assessments to balance the benefits of preventing tooth decay while limiting any unwanted health effects. These scientific assessments will also guide EPA in making a determination of whether to lower the maximum amount of fluoride allowed in drinking water, which is set to prevent adverse health effects.

The new EPA assessments of fluoride were undertaken in response to findings of the National Academies of Science (NAS). At EPA's request, in 2006 NAS reviewed new data on fluoride and issued a report recommending that EPA update its health and exposure assessments to take into account bone and dental effects and to consider all sources of fluoride. In addition to EPA's new assessments and the NAS report, HHS also considered current levels of tooth decay and dental fluorosis and fluid consumption across the United States.

UPDATE: The notice of the proposed recommendation published in the Federal Register on January 13 and HHS will accept comments from the public and stakeholders on the proposed recommendation for 30 days at CFRComments@cdc.gov. HHS is expecting to publish final guidance for community water fluoridation by spring 2011. The proposed recommendation is available at

<http://www.gpo.gov/cgi-bin/TEXT?rate.cgi?WAS:docID=W0YUw1/0/1/0&WASAction=retrieve>. Comments regarding the EPA documents, *Fluoride: Dose-Response Analysis For Non-cancer Effects and Fluoride: Exposure and Relative Source Contribution Analysis* should be sent to EPA at FluorideScience@epa.gov. The documents can be found at http://water.epa.gov/action/advisories/drinking/fluoride_index.cfm

For more information about community water fluoridation, as well as information for health care providers and individuals on how to prevent tooth decay and reduce the chance of children developing dental fluorosis, visit <http://www.cdc.gov/fluoridation>. For information about the national drinking water regulations for fluoride, visit: <http://water.epa.gov/drink/contaminants/basicinformation/fluoride.cfm>

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Last revised: May 7, 2011

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FOR IMMEDIATE RELEASE
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Q & A on Community Water Fluoridation

1. What do we know about fluoride and fluoridation?

- Fluoride exists naturally in nearly all water supplies. Water is “fluoridated” when a public water system adjusts the fluoride to a level that is optimal for preventing tooth decay.¹
- About 74 percent of Americans whose homes are connected to public water systems receive fluoridated water. However, more than 72 million Americans do not have access to drinking water that is fluoridated to prevent decay.

2. Does fluoridated water prevent tooth decay?

- Yes. Research proves that fluoridation reduces tooth decay by about 25 percent.⁴ As the rate of fluoridation steadily increased in the U.S., the average number of decayed, filled or missing teeth among 12-year-olds fell 68 percent between 1966 and 1994.⁵
- The evidence supporting fluoridated water’s effectiveness continues has been building for decades—and recent studies strengthen earlier findings:
 - A New York study (2010) revealed that low-income children in less fluoridated counties needed 33 percent more fillings, root canals, and extractions than those in counties where fluoridated water was common.⁶
 - A study of Alaska children (2011) showed that kids living in non-fluoridated areas had a 32 percent higher rate of decayed, missing or filled teeth than kids in fluoridated communities.⁷
 - A Nevada study (2010) examined teenagers’ oral health and found that living in a community without fluoridated water was one of the top three factors associated with high rates of decay and other dental problems.⁸
 - A study of Illinois communities (1995) reviewed changes in decay rates during the 1980s. This study concluded that water fluoridation was “the dominant factor” in the decline of cavities.⁹
 - Teenagers living in non-fluoridated areas of Ireland had an average rate of decay or related dental problems that was 52 percent higher than those living in fluoridated communities.¹⁰
- Research demonstrates the long-term benefits of fluoridation. A 2010 study confirmed that the fluoridated water consumed as a young child makes the loss of teeth (due to decay) less likely 40 or 50 years later when that child is a middle-aged adult. The coauthors wrote that this study “suggests that the benefits of [fluoridation] may be larger than previously believed and that [fluoridation] has a lasting improvement in racial/ethnic and economic disparities in oral health.”¹¹

3. Decay is more of a problem for low-income people. Does fluoridated water help address this gap in oral health?

- Yes, it does. Fluoridation reduces the disparities in tooth decay rates that exist by race, ethnicity and income.
- A 2002 study called water fluoridation “the most effective and practical method” for reducing the gap in decay rates between low-income and upper-income Americans. The study concluded, “There is no practical alternative to water fluoridation for reducing these disparities in the United States.”¹²

4. Does fluoridation also benefit adults or only children?

- Tooth decay is a health problem throughout the lifespan. Nearly all (96 percent) of middle-aged adults have had tooth decay and the rate of new decay per year is at least as high for adults as it is for children.¹³
- Fluoridation benefits people of all ages. A 2007 report examined 20 studies to estimate fluoride’s impact on adult teeth, and the report concluded that fluoridated water reduced decay by 27 percent.¹⁴
- Seniors benefit from fluoridation, partly because it helps prevent decay on the exposed root surfaces of teeth—a condition that especially affects older adults.¹⁵

5. Is fluoridated water still needed?

- Yes. Fluoridation remains critically important. Tooth decay is widespread, affecting more than 90 percent of Americans by the time they reach their adult years.¹⁶
- At a time when more than 100 million Americans lack dental insurance, fluoridation offers an easy, inexpensive preventive strategy that everyone benefits from simply by turning on their tap.³
- Although Americans’ dental health has improved considerably in recent decades, tooth decay and other oral health issues remain a challenge. A 2010 study revealed that nearly one out of seven children aged 6 to 12 years had suffered a toothache over the previous six months.¹⁷
- Even the U.S. armed forces recognize the need for fluoridated water. A senior official with the Department of Defense called tooth decay “a major problem for military personnel” and notes that fluoridation will “directly reduce their risk for dental decay and improve [military] readiness.” Most military bases have provided fluoridated water for decades.¹⁸
- Fluoridated water is also the most inexpensive way to provide fluoride. The per-person annual cost of fluoride rinse programs is roughly double the cost of

fluoridated water. The per-person annual cost of fluoride supplements is more than 70 times higher than fluoridated water. Fluoride varnishes or gels also cost more than providing fluoridated water.¹⁹

6. Isn't using fluoride toothpaste enough?

- No. Many years after fluoride toothpaste became widely used, an independent panel of experts examined the specific impact of water fluoridation and determined that fluoridation reduces tooth decay by about 29 percent.²⁰ Even today, fluoridated water plays a critical role of maximizing protection against decay.
- The co-author of a 2010 study noted that research has confirmed “the most effective source of fluoride to be water fluoridation.”²¹

7. Exactly how does fluoride work to prevent tooth decay?

- The fluoride in drinking water works in two ways. For people of all ages, it works topically on tooth surfaces. Fluoride mixes with saliva, and when the saliva neutralizes acids produced by bacteria on teeth, the fluoride joins the enamel crystals on the tooth surfaces, healing and protecting the teeth from further decay.²²
- Fluoridated water works systemically when it's swallowed by young children while teeth are forming. Fluoride combines with the calcium and phosphate of the developing teeth and makes them more resistant to decay, especially during the first few years after they come into the mouth.²³ Research has confirmed that systemic use of fluoride increases the concentration of fluoride in the surface enamel of teeth.²⁴

8. If fluoridation is effective, why are people still getting cavities?

- Fluoride in various forms has reduced tooth decay, but fluoride alone cannot guarantee someone a life without any cavities. Diet and nutrition play a role, and so do other 4 factors — like the frequency with which people get routine dental care. But we know from decades of research that fluoridation does reduce the rate of decay.
- More than 100 million Americans have a drinking water supply that is not fluoridated to the optimal level that helps prevent decay.²⁵ Getting fluoridated water to more U.S. residents would help reduce the incidence of decay.

9. Is it right to add something to water without getting individuals' consent?

- It would be virtually impossible for any individual to consume food or water that wasn't fortified with at least some added ingredients to benefit human health.
 - Iodine is added to salt to prevent goiter, which affects the thyroid gland.
 - Chlorine is added to prevent outbreaks of E. coli or other forms of bacteria in drinking water.
 - Folic acid is added to many breads and cereals to produce healthy red blood cells.
- Our society respects individual rights, but every right has its boundaries. In America, there are certain policies we adopt communitywide or nationwide because they are cost-effective ways to strengthen health and security. Courts have consistently held that it is legal and appropriate for a community to adopt a fluoridation program.²⁶

10. Is ending fluoridation a way to save tax dollars?

- No. In fact, ending fluoridation imposes a hidden "tax" on families and taxpayers because it is likely to increase their dental expenses to treat decayed teeth. The evidence proves that fluoridation is inexpensive to maintain and saves money down the road. The typical cost of fluoridating a local water system is between 40 cents and \$2.70 per person, per year—less than the cost of medium-sized latte from Starbucks.²⁷
- For most cities, every \$1 invested in water fluoridation saves \$38 in dental treatment costs.²⁸ A 2003 study in Fort Collins, Colorado, estimated that if the city discontinued fluoridation, it would cost its residents more than \$534,000 per year.²⁹ In 2003, water fluoridation saved Colorado nearly \$149 million by avoiding unnecessary treatment costs. The study found that the average savings in these fluoridated communities were roughly \$61 per person.³⁰
- Scientists who testified before Congress in 1995 estimated that national savings from water fluoridation totaled more than \$3.8 billion each year.³¹
- Taxpayers save money because fluoridation reduces Medicaid expenses on dental treatments. Studies in Texas and New York have shown that states save approximately \$24 per person, per year in Medicaid expenditures because of the cavities that were prevented by drinking fluoridated water.³²

11. Has the momentum shifted against water fluoridation?

- No. Although it's true that some communities have chosen to stop fluoridating over the past year, the overall trend shows a continued increase in the number of Americans who receive fluoridated water. Between 2000 and 2008, an additional 34 million Americans gained access to fluoridated drinking water.³³

- Since 1992, the percentage of people on public water systems who receive fluoridated drinking water has risen from 62 percent to 72 percent. The rate of this increase has picked up in the past eight years.³⁴
- Since January 2011, Arkansas has enacted a state law guaranteeing access to fluoridated water for an additional 640,000 residents, and a water board in San Jose, Calif., has voted to fluoridate its water. The California vote means that more than 280,000 additional people will eventually gain access to fluoridated water.

12. Is fluoridated drinking water safe?

- Yes. Over the past several decades, hundreds of studies have confirmed the safety of fluoride. According to the Centers for Disease Control and Prevention, “panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective.” This issue has been studied thoroughly, and there is no credible evidence to support the claims that anti-fluoride activists make.³⁵
- The new recommended level for fluoridating water (0.7 milligrams per liter) should strengthen the public’s confidence that health officials are periodically reviewing standards and—when appropriate—updating them.³⁶ The American Dental Association welcomed the new fluoride recommendation, noting that fluoridation remains “one of our most potent weapons in disease prevention.”³⁷
- The American Academy of Family Physicians, the World Health Organization, the Institute of Medicine and many other respected health and medical authorities have endorsed water fluoridation as a safe and effective practice.³⁸
- What is true for calcium and potassium is also true for fluoride—even a beneficial mineral, if consumed at extraordinarily high levels, can potentially be detrimental to one’s health. The good news is that federal health standards guide local water companies, enabling them to fluoridate water at levels that are safe and effective.

13. Should we do more studies on fluoridation before continuing this practice?

- More than 3,000 studies or research papers have been published on the subject of fluoridation.³⁹ Few topics have been as thoroughly researched as fluoridation. The overwhelming weight of the evidence—plus more than 65 years of experience—supports the safety and effectiveness of this public health practice.
- It’s doubtful that even a hundred new studies would convince the anti-fluoride activists to reconsider the misleading attacks they make against fluoridation.
- Although additional studies are always welcomed, the existing research—including several studies in the past decade—provides solid support for

fluoridation. As the Centers for Disease Control and Prevention has written, “For many years, panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective.”⁴⁰

14. I read something on the Internet about a condition called “fluorosis.” Is that a reason not to fluoridate drinking water?

- No. Nearly all fluorosis in the U.S. is a mild, cosmetic condition that leaves faint white streaks on teeth. It doesn’t cause pain, and it doesn’t affect the health or function of the teeth. In fact, it’s so subtle that it usually takes a dentist to even notice it.
- Experts believe that in many cases fluorosis occurs because young children consume toothpaste while brushing their teeth. This is why dentists and health officials recommend that parents supervise young children while they are brushing their teeth.
- A study published in 2010 found that mild fluorosis was not an adverse health condition and that it might even have “favorable” effects on overall health. That’s why the study’s authors said there was no reason why parents should be advised not to use fluoridated water in infant formula.

15. I heard that the federal government reduced the level of fluoride recommended for drinking water in 2011. What was the reason for that change?

- In January 2011, the U.S. Department of Health and Human Services (HHS) recommended that the optimal level of fluoride in public water systems should be 0.7 milligrams per liter of water. HHS’ new level reflects the fact that Americans today get fluoride from more sources—such as toothpaste and mouth rinses—than they received when the original level was set.⁴¹
- The HHS recommendation will continue to protect Americans’ dental health while minimizing the chance of fluorosis—a typically mild, cosmetic condition that causes faint white streaks on teeth. The effect of mild fluorosis is so subtle that only a dentist would⁷ notice it while doing an examination. This condition does not cause pain and does not affect the function or health of the teeth.⁴²

16. Should the public vote on whether to fluoridate local water systems?

- The health and well-being of Americans is a national concern. However, state laws and city ordinances determine the process for how a community decides whether to fluoridate. The key is to ensure that those making this decision are relying on sound, scientifically accurate information.⁴³

- Elected officials make a wide range of decisions about health issues. We feel comfortable having them set policies on water fluoridation, and we want to ensure they understand fully what the science shows before setting those policies.

17. How do we know the fluoride additives used to fluoridate drinking water are safe?

- The quality and safety of fluoride additives are ensured by Standard 60, a program that was commissioned by the Environmental Protection Agency (EPA). Standard 60 is a set of standards created and monitored by an independent committee of experts, involving the Association of State Health Officials and other key organizations. This committee provides regular reports to the EPA.⁴⁴
- More than 80 percent of fluoride additives are produced by U.S. companies, but nomatter where they come from, Standard 60 uses on-site inspections and even surprise“spot checks” to confirm these additives meet quality and safety standards.⁴⁵

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⁴⁵E-mail communication from Kip Duchon, U.S. Centers for Disease Control and Prevention, to the Pew Center on the States, March 26, 2012. (Note: Duchon is the CDC’s National Fluoridation Engineer.)

Community Water Fluoridation



"...one of ten great public health achievements of the twentieth century."¹



Fluoridation in New York State: A Fact Sheet

Addressing Safety Concerns

Fluoride at some level is naturally present in water and food. In New York State, it is not uncommon to have naturally occurring fluoride at 0.2 to 0.5 milligrams per liter of water (mg/L). Thus, all New Yorkers are exposed to some levels of fluoride. Fluoridation of community drinking water is the adjustment of the existing natural fluoride concentration in drinking water to a level that is recommended for tooth decay prevention. The Centers for Disease Control and Prevention (CDC), the Office of the United States' Surgeon General and the New York State Department of Health support fluoridation of public water supplies because of the public health benefits, while being cognizant of the possible health risks of too much fluoride ingestion.

Who is Responsible for Regulating Chemicals in Drinking Water?

The main federal law that ensures the quality of Americans' drinking water is the Safe Drinking Water Act (SDWA). Under SDWA, the U.S. Environmental Protection Agency (EPA) sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. Standards are set to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. Within New York State, the New York State Department of Health (NYS DOH) oversees the delivery of drinking water to assure that it is suitable for people to drink. Fluoride in drinking water is regulated by EPA and New York State.

Fluoride that is added to drinking water is subject to a system of standards, testing, and are certified by the American Water Works Association (AWWA) and the National Sanitation Foundation/American National Standards Institute (NSF/ANSI). Both of these entities are nonprofit, nongovernmental organizations. The NSF/ANSI standards 60 and 61 limit a chemical or product's contribution of contaminants to drinking water applications. Standards 60 and 61 provide for product purity and safety assurance that aim to prevent adding harmful levels of contaminants from water treatment additives. New York State has regulations requiring product compliance with Standards 60 and 61.

What is the concentration of fluoride recommended for drinking water in New York State?

- The target fluoride concentration in water recommended for tooth decay prevention in NYS is 1 mg/L. The New York State Department of Health monitors all water systems that add fluoride to assure that the concentration of fluoride is in the range of 0.8 to 1.2 mg/L.
- The maximum concentration allowed in New York State drinking water for fluoride, including naturally occurring levels, is 2.2 mg/L. This standard is lower than the federal standard and is the standard that the State public water supplies must meet.

- The federal drinking water standard (maximum contaminant level) for fluoride in drinking water, including fluoride that naturally occurs, is 4 milligrams per liter of water (4 mg/L). This is set to prevent Stage III skeletal fluorosis, a crippling bone and joint condition.
- The EPA has also set a non-enforceable standard called secondary maximum contaminant level for fluoride, including naturally occurring fluoride. This standard of 2 mg/L of fluoride in water was set to reduce the cosmetic effects on teeth (moderate and severe forms of enamel fluorosis), which is a discoloration and/or pitting of teeth.

What are the risks associated with exposure to fluoride at 1 mg/L in drinking water?

A systematic review conducted by the University of York, UK assessed the evidence for potential adverse effects. This review did not reveal causal association between fluoride in drinking water at 1 mg/L and severe enamel fluorosis, skeletal fluorosis, bone fractures or bone cancer. Water fluoridation is associated with an increased occurrence of milder forms of enamel fluorosis.² Enamel fluorosis that results from drinking fluoridated water appears as a barely noticeable white marking of the outer tooth enamel that is of no cosmetic or functional significance. A study conducted in New York State showed that the prevalence of enamel fluorosis ranged from 14.4% to 18.6% in fluoridated communities. However, the study also showed that the prevalence of enamel fluorosis in non-fluoridated communities ranged from 11.1% to 14.8%.³ Given that fluorosis occurred in both fluoridated and non-fluoridated communities, it is likely that water fluoridation is not the only risk factor for mild fluorosis. Other risk factors included use of fluoridated tooth paste by young children and dietary supplements.³ (Many parents may not be aware that use of fluoride toothpaste is not recommended in children under age 2 years without consulting a dentist). Nonetheless, the NYSDOH has concluded that the known benefits of fluoride to prevent or reduce the incidence of tooth decay and dental fillings outweigh the risk of milder forms of fluorosis (which is not considered as an adverse effect by public health agencies).

What are the risks associated with exposure to fluoride at 4 mg/L (and above) in drinking water?

The effects generally associated with high levels of exposure to fluoride include severe enamel fluorosis, skeletal fluorosis, and bone fractures. A recently released National Research Council (NRC) report titled *Fluoride in Drinking Water*⁴ made the following observations:

- Severe enamel fluorosis occurs in about 10% of children in US communities with water fluoride concentrations at or near the current federal drinking water standard of 4 mg/L. The prevalence of severe enamel fluorosis is very low below about 2 mg/L of fluoride in drinking water.
- There are very few known clinical cases of skeletal fluorosis in the US, where about 200,000 people (in 1992) had water concentrations of 4 mg/L or above.³
- Overall, there was consensus among the committee that there is scientific evidence that under certain conditions fluoride can weaken bone and increase the risk of fractures. However, there was not a consensus on the group about the risks of bone fractures associated with 4 mg/L in drinking water in the US. The majority of the committee concluded that lifetime exposure to fluoride at drinking water concentrations of 4 mg/L or higher is likely to increase fracture rates in the population, particularly in some people who are prone to accumulate fluoride into their bones (e.g., people with renal disease). However, three of the 12 members judged that the evidence only supported a conclusion that the EPA standard (MCLG) might not be protective against bone fracture, and that more evidence is needed that bone fractures occur at an increased frequency in human populations exposed to fluoride at 4 mg/L before drawing a conclusion that the EPA standard likely poses a risk of increased bone fracture.

- The evidence as to whether fluoride is or is not associated with cancer is not clear. Some studies show no association; others show an association. An exploratory study showed an increasing risk for osteosarcoma with age (peak at age 7) among boys but not in girls. An exploratory study showed an increased risk for osteosarcoma with age (peak at age 7) among boys but not in girls. A relatively large scale study is underway at Harvard School of Dental Medicine and is expected to be published soon. According to the investigators at Harvard, the findings of the earlier study could not be replicated. The NRC Committee advised the EPA to consider the results of this study to help determine what follow-up studies are needed.
- Sufficient relevant data were not available to consider the effects of fluoride on any other systems in the body.

Two studies conducted by investigators in the New York State Department of Health failed to show an association between fluoridation and osteosarcoma in New York State.^{5,6}

What does the NRC committee's report mean for New York State residents?

Naturally occurring fluoride levels of 4 mg/L or above in drinking water supplies (private or public) are rare in NYS and the NYS standard for fluoride in public water supplies is 2.2 mg/L. Moreover, the target concentration for water fluoridation is 1 mg/L. Thus, it is unlikely that NYS residents are exposed to drinking water containing 4 mg/L of fluoride.

Because the NRC committee did not evaluate the risks or benefits of the lower fluoride concentrations (0.7 to 1.2 mg/L) used in water fluoridation, the committee's conclusions regarding the potential for adverse effects such as severe enamel fluorosis, skeletal fluorosis and bone fractures from exposure to fluoride at 2 to 4 mg/L in drinking water do not apply at the lower water fluoride levels commonly experienced by New York State residents.

What can be done to reduce the risk of enamel fluorosis?

The proper amount of fluoride helps prevent and control tooth decay. An excessive amount consumed during tooth development in infancy and childhood can also result in a range of changes in the enamel surface of the tooth. These changes have been broadly termed enamel fluorosis. Ingestion of fluoride toothpaste and inadvertent use of fluoride tablets in fluoridated areas have been associated with an increased risk for enamel fluorosis. Here are some simple ways to reduce the risk of enamel fluorosis:

- Know the fluoride concentration in the source of drinking water. Water containing 1 mg/L is considered optimum for caries prevention. There is no need for fluoride supplements if the fluoride level in water is greater than 0.6 mg/L.
- Counsel parents and caregivers on the use of fluoride toothpaste by young children, especially those younger than 2 years to avoid ingestion of too much toothpaste because it has high concentration of fluoride (approximately 1000 parts per million). Children under age 6 should use only a pea-sized amount of fluoride toothpaste twice a day; parents should consult their child's doctor or dentist concerning use of fluoride toothpaste for children under age 2.

Some reports have also expressed concern about the amount of fluoride contained in water used for mixing infant formula may also influence the possibility of developing enamel fluorosis. The New York State Department Health concurs with the Centers for Disease Control and Prevention (CDC) that water fluoridated at the optimum level has not been shown to cause adverse health effects.

(www.health.state.ny.us/prevention/dental).⁸ Further, the department has concluded that the risk of

enamel fluorosis associated with infant formula prepared with fluoridated water is low for several reasons:

- The occurrence of advanced forms of enamel fluorosis is extremely rare in fluoridated communities even though some water systems have been fluoridating for over 50 years. Milder forms of enamel fluorosis are not noticeable.
- The critical period for permanent tooth development when enamel fluorosis is most likely to occur, is later in life when children are less likely to be on infant formula.
- The theoretical amounts of fluoride that might cause advanced forms of enamel fluorosis are reached with exclusive and/or excessive formula use for a prolonged period. According to the National Center for Education in Maternal and Child Health's Bright Futures Guidelines, infants should begin solid foods between four and six months, if they are developmentally ready. This will also reduce the exposure to excessive levels of fluoride. Therefore, if infant formula is used as recommended the risk of enamel fluorosis would be minimized significantly.

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New York State Department of Health
547 River Street
Troy, New York, 12180-2216
Phone: (518) 402 7652
<http://www.nyhealth.gov/environmental/water/drinking/>

Surgeons General: Strong, Consistent Support For Community Water Fluoridation

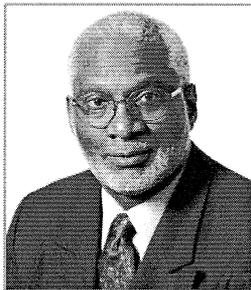


“With the development of fluoridated drinking water and dental sealants, Americans are less likely to experience tooth loss and gingivitis by middle age ... Community water fluoridation continues to be a vital, cost-effective method of preventing dental [cavities].”

Dr. Regina Benjamin,
U.S. Surgeon General (2009-current)

“Water fluoridation has helped improve the quality of life in the United States by reducing pain and suffering related to tooth decay, time lost from school and work, and money spent to restore, remove or replace decayed teeth.”

Dr. Richard Carmona
U.S. Surgeon General (2002-2006)



“More than 50 years of scientific research has found that people living in communities with fluoridated water have healthier teeth and fewer cavities than those living where the water is not fluoridated. ... A significant advantage of water fluoridation is that anyone, regardless of socioeconomic level, can enjoy these health benefits during their daily lives — at home, work, or at school or play — simply by drinking fluoridated water or beverages prepared with fluoridated water.”

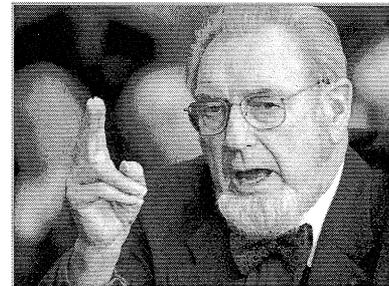
Dr. David Satcher, U.S. Surgeon General (1998-2002)

“Data consistently have indicated that water fluoridation is the most cost-effective, practical, and safe means for reducing the occurrence of tooth decay in a community.”

Dr. Audrey Manley
U.S. Surgeon General (1995-1997)

Fluoridation is “the single most important commitment a community can make to the oral health of its children and to future generations.”

Dr. C. Everett Koop
U.S. Surgeon General (1982-1989)



Learn more at: iLikeMyTeeth.org/Fluoridation

Community Water Fluoridation



"...one of ten great public health achievements of the twentieth century."¹



Fluoridation in New York State: A Fact Sheet

Operational \Engineering Aspects

What are the monitoring and testing requirements for fluoridated water systems in New York State?

Daily Analysis: For systems that fluoridate, the Department regulations require daily sampling of the fluoride level in the finished drinking water. These daily samples should be used as a safety measure and to monitor operational parameters. These daily samples can be analyzed inexpensively on site by the operator, and the results must be recorded and forwarded on a monthly basis to the local health department. These results should be submitted to the local health department on form DOH-360 CFL, which can be found on line at <http://www.nyhealth.gov/environmental/water/drinking/forms/forms.htm>.

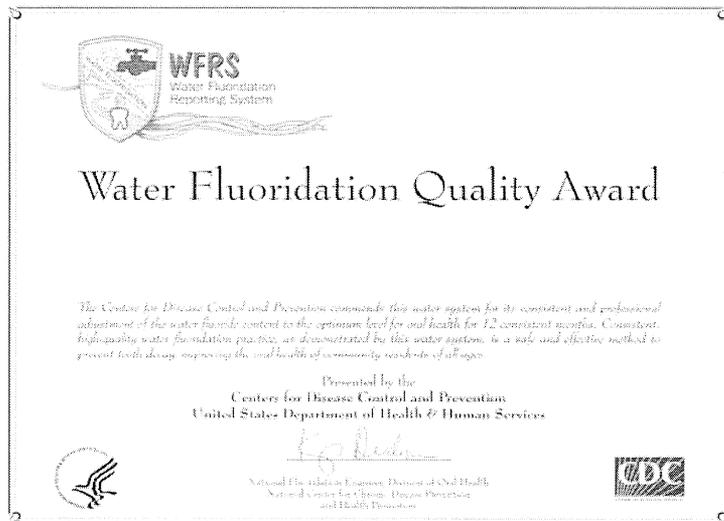
Monthly Analysis: Also, once per month a split sample must be collected for simultaneous analysis by the operator and an Environmental Laboratory Approval Program (ELAP) certified lab. This split sample is analyzed by a precise analytical method that typically is not susceptible to interference or imprecision common to field measuring methods and is meant to provide an accurate benchmark for the system and field tests. Properly certified commercial labs may be used, but water systems are encouraged to send the monthly split sample to the New York State Wadsworth Lab in Albany for analysis at no cost, excluding sample return postage. Testing kits will be sent from Wadsworth to participating water systems. Inclusion in the Wadsworth program can be arranged through a request to the local health department with: the system's name, the system's federal identification number, mailing address, contact name, contact phone number and gazetteer code.

What is the CDC's Proficiency Testing Program?

Fluoridating water systems should be adjusting fluoride dosages and assessing the accuracy of their daily testing values based on results from the monthly lab samples in an effort to achieve the optimal level. Wadsworth Lab is the only New York State lab that participates in the Centers for Disease Control and Prevention's (CDC's) Proficiency Testing Program, further enhancing the validity of the results. Wadsworth will send the results directly back to the operators. This should provide the results in a more consistent and timely manner.

How does a fluoridating water system receive a CDC Fluoridation Quality Award?

Quality Awards: Water systems that consistently report daily and monthly sample results to the Department and maintain an optimal level of fluoride for twelve consecutive months will be nominated for the CDC's Fluoridation Quality Award.



How can I get technical assistance?

Technical assistance for fluoridation is available from your local health department, Bureau of Water Supply Protection, and may also be available through the New York Rural Water Association. The following recommendations are made to help address common sources of variability in fluoride levels:

- Fluorosilicic acid strength should be verified upon delivery from the chemical supplier. This can be done either with testing of the delivered product or certification by the vendor. Test procedures are specified in the American Water Works Association (AWWA) standards for the specific fluoride chemicals (B701, B702, & B703). Most water treatment plant laboratories should be able to conduct these tests.
- Fluoride saturators need to be properly filled (i.e. at least 12 inches of coarse crystalline grade sodium fluoride) and have an influent water flow of 2 gallons per minute (gpm) or less in order to provide a fully saturated solution with a consistent concentration. Powdered sodium fluoride should not be used in a fluoride saturator in place of the coarse crystalline form as the powder tends to not fully dissolve, resulting in significantly different solution concentrations.
- A properly operated fluoride saturator should consistently produce a saturated solution with a fluoride concentration of 18,000 ppm. However, fluoride solution strength from saturators should be verified by periodic batch testing.
- Dosage calculations should be based on the actual strength of the solutions, as determined by testing or vendor certification.

What is Optimal Fluoride Level for New York State?

The optimal fluoride level in New York State is 1.0 mg/L. This level provides the most benefit to oral health. This is achieved when the fluoride level in finished water is maintained in the control range of 0.8 to 1.2 mg/L. Targeting the lower end of the control range, instead of 1.0 mg/l, can substantially reduce the benefit provided to the community, as the benefits of fluoridation are lost when fluoride levels drop below the optimal level.

Water Fluoridation Posters for New York State

Water Fluoridation Posters are handy tools to review the benefits of water fluoridation, discuss why maintaining an optimal level of fluoride is important for the community, and provide technical information and safety for operators.

Water Fluoridation Reporting System for New York State

The CDC Water Fluoridation Reporting System (WFRS) is another resource where daily and monthly fluoride levels are entered and monitored for New York State.

Water Fluoridation Additives used in New York State

Three additives—sodium fluoride, sodium fluorosilicate, and fluorosilicic acid—may be used to adjust the natural fluoride levels in water to concentrations that prevent or reduce tooth decay. Learn more about these additives and how they work in water by reading the CDC Fact Sheet “Water Fluoridation Additives.”

For more information, contact:

Division of Oral Health
Centers for Disease Control and Prevention
4770 Bufford Highway, NE, MSF-10
Atlanta, GA 30333
Phone: 770-488-6054
<http://www.cdc.gov/fluoridation/index.htm>

New York State Department of Health
Bureau of Dental Health
ESP, Tower Bldg, Room 542
Albany NY, 12237
Phone: 518-474-1961
<http://www.nyhealth.gov/prevention/dental/>

Bureau of Water Supply Protection
New York State Department of Health
547 River Street
Troy, New York, 12180-2216
Phone: (518) 402 7652
<http://www.nyhealth.gov/environmental/water/drinking/>

Community Water Fluoridation



"...one of ten great public health achievements of the twentieth century."¹



Fluoridation in New York State: A Fact Sheet

Training

The **Water Plant Operator Training** is provided to cover the following topics:

- Health Benefits and Regulatory Perspectives.
- Additives, Equipment, Analysis, Safety, and Operation

The **Spokesperson Training** covers the following:

- The most recent scientific, evidence-based information regarding community water fluoridation to spokesperson volunteers.
- Provides fluoridation spokesperson training to professional volunteers representing various locations across the state, in order for these individuals to be knowledgeable and confident to discuss the benefits, effectiveness, and cost of community water fluoridation with members of their communities.

For more information, contact:

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Centers for Disease Control and Prevention
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What Respected Organizations and Experts Say About Water Fluoridation

BROUGHT TO YOU BY:

life is better
WITH TEETH

CAMPAIGN IN DEFENSE OF ORAL HEALTH

Academy of General Dentistry

"Fluoride makes the entire tooth structure more resistant to decay and promotes remineralization, which aids in repairing early decay before damage is even visible. Studies have confirmed the most effective source of fluoride to be water fluoridation."¹

"Instead of drilling holes to fix cavities, dentists would rather educate the public on how to avoid developing tooth decay in the first place. Drinking tap water to receive fluoride is safe, and it's easier on your wallet than going to the dentist for a filling."²

American Academy of Pediatrics:

"Fluoride plays a very important role in the prevention of dental caries. Although the primary mechanism of action of fluoride in preventing dental caries is topical, systemic mechanisms are also important."³

"Water fluoridation is a cost-effective means of preventing dental caries, with the lifetime cost per person equaling less than the cost of 1 dental restoration. In short, fluoridated water is the cheapest and most effective way to deliver anticaries benefits to communities."⁴

American Academy of Pediatrics (New York State Chapter):

"Community water fluoridation is safe, effective and necessary to prevent chronic dental disease in pediatric populations."

"Dental decay is a common but preventable, chronic disease. It is our youngest children who are at the greatest risk for developing early dental disease while not having access to a dental care home. ... Without community water fluoridation the incidence of this disease and its attendant complications will increase."⁵

American Academy of Family Physicians:

"Fluoridation of public water supplies is a safe, economical, and effective measure to prevent dental caries."⁶

American Academy of Physician Assistants:

"Primary prevention keeps disease from occurring at all by removing its causes. Examples of primary prevention include . . . giving immunizations for many communicable diseases, and counseling patients to adopt healthy lifestyles . . . Examples include chlorination and fluoridation of the water supply . . ."⁷

"Fluoride substantially decreases caries rates. . . . All children should receive fluoride through systemic water fluoridation or dietary supplements."⁸

American Association for the Advancement of Science:

"... fluoridation of community water supplies is repeatedly demonstrating that it is an effective public health measure for the mass partial control of dental cavities, and ... [AAAS is] on record as endorsing fluoridation of community water supplies as a method for advancing dental public health, as this 121st meeting of the AAAS."⁹

American Association of Oral and Maxillofacial Surgeons:

"Community water fluoridation, which adjusts the fluoride in water to a level sufficient for preventing and controlling tooth decay, reduces tooth decay by 30–50%."

"Although great progress has been made, nearly 28% of public water systems do not have the capacity to deliver—and approximately 100 million Americans do not have access to—optimally fluoridated water. Many communities need support to upgrade or purchase new water systems and fluoridation equipment."¹⁰

American Association of Public Health Dentistry:

"... it has been shown that children with the greatest dental need and who are at highest risk for tooth decay benefit the most from water fluoridation."

The resolution also stated: "The Association recommends that federal, state, and local agencies and organizations promote water fluoridation as the foundation for better oral health."¹¹

American Council on Science and Health:

"Fluoride is harmless at the levels necessary for maximum (dental) benefits. Thousands of studies on fluorides and fluoridation have been completed in the last 50 years — more than 3,700 since 1970 alone. Over 50 peer-reviewed epidemiological studies have dealt with the claim that fluoridation increases cancer risk. None has substantiated the claim."¹²

American Dental Association:

"Studies conducted throughout the past 65 years have consistently shown that fluoridation of community water supplies is safe and effective in preventing dental decay in both children and adults. Simply by drinking water, children and adults can benefit from fluoridation's cavity protection whether they are at home, work or school."¹³

American Dental Education Association:

"ADEA supports and encourages fluoridation of community water supplies and the use of topical fluoride. Community water fluoridation is safe, practical, and the most cost-effective measure for the prevention of dental caries."¹⁴

American Dental Hygienists' Association:

"Good scientific evidence supports the use of community water fluoridation and the use of fluoride dental products for preventing tooth decay for both children and adults."

"Adjusting the level of fluoride in drinking water first used fluoride as a preventative for tooth decay in Grand Rapids, Michigan. Fluoridation of drinking water has been used successfully in the United States for more than 50 years."¹⁵

American Dietetic Association:

"The American Dietetic Association reaffirms that fluoride is an important element for all mineralized tissues in the body. Appropriate fluoride exposure and usage is beneficial to bone and tooth integrity and, as such, has an important, positive impact on health throughout life."¹⁶

American Federation of Teachers:

"The good news is that tooth decay and other oral diseases are preventable. The combination of dental sealants and fluoride has the potential to nearly eliminate tooth decay in school-age children."¹⁷

American Medical Association:

"The AMA urges state health departments to consider the value of required statewide fluoridation (preferably a comprehensive program of fluoridation of all public water supplies, where these are fluoride deficient), and to initiate such action as deemed appropriate."¹⁸

AMA has also encouraged physicians to "become involved" in the fluoridation issue by determining "whether municipal water supplies are optimally fluoridated and ... working with public health agencies to take corrective action if suboptimal fluoridation is found."¹⁹

American Osteopathic Association:

"The American Osteopathic Association supports the fluoridation of fluoride-deficient public water supply."²⁰

American Public Health Association:

"[The U.S. Department of Health and Human Services] announced proposed recommendations to simplify the recommended optimal level for community water systems to 0.7 mg/L fluoride ... APHA continues to support community water fluoridation as a sound public health preventive measure. APHA is supportive of the process of updating recommendations for optimal fluoride concentrations in water based on today's conditions."²¹

American Society for Clinical Nutrition:

"... the American Society for Clinical Nutrition agrees that fluoridation of community water supplies to an optimum level wherever the natural level is less than optimum is a safe, economical, and effective measure to improve dental health by improving nutrition."²²

American Water Works Association:

"... community water fluoridation at optimal levels is beneficial for preventing tooth decay.

"The goal of community water fluoridation is to achieve the desired oral health benefit while minimizing potential health risks. That is why water providers undergo thorough and extensive training to safely apply fluoride in the amount recommended by the world's most respected public health authorities."²³

Association of California Water Agencies:

"ACWA is a diverse state wide organization representing nearly 450 public water agencies that collectively supply 90% of the water delivered in California for domestic, agricultural and industrial uses. California enjoys some of the highest water quality in the world.

"... ACWA reaffirms its support for water fluoridation and strongly believes that its benefits need to be continued to communities served by centralized water systems."²⁴

Association of State & Territorial Dental Directors:

"Community water fluoridation remains the cornerstone of dental caries prevention in the United States and has been demonstrated to be safe, cost-effective and beneficial through every stage of life and for all people, regardless of age, race, ethnicity or socio-economic status."²⁵

Audrey F. Manley, M.D., M.P.H., Surgeon General under President Bill Clinton:

"Water fluoridation continues to be the cornerstone of community oral disease prevention. The benefits of fluoridation are available, on average, for little more than \$0.50 per person per year, and even less, in large communities."²⁶

Australian Dental Association:

"Drinking fluoridated water several times a day is the ideal way to give your teeth a quick fluoride treatment."

"... Fluoride from fluoridated water is found in saliva and provides a wonderful, low concentration fluoride treatment for your teeth."²⁷

The Bower Foundation:

"The most inexpensive way to deliver the benefits of fluoride to all residents of a community is through water fluoridation. For most cities, every dollar invested in public water fluoridation saves \$38 in dental treatment costs."²⁸

British Dental Association:

"The BDA is pleased with [a program to expand fluoridation in southwest England] because it is likely to encourage consultation on similar schemes in other parts of the country where fluoride could help address the poor dental health of the population."

"A recent European summary of the latest scientific evidence reiterated the view that water fluoridation is a safe and effective method of reducing oral health inequalities."²⁹

British Dental Health Foundation:

"Fluoride was added to the Birmingham supply in 1964 and the difference in dental health compared to the neighbouring population in non-fluoridated Sandwell was stark. When Sandwell's water was fluoridated in 1987 it transformed levels of oral health, putting a poor borough amongst the top ten areas for dental health in the country."³⁰

British Medical Association:

"The BMA remains committed to the fluoridation of mains water supplies, after appropriate public consultation, on the grounds of effectiveness, safety and equity."³¹

Canadian Dental Association:

"Fluoride is added to public drinking water to protect all members of the community from tooth decay. Community water fluoridation is a safe and effective way of preventing tooth decay at a low cost."³²

Canadian Public Health Association

"In 1945, Brantford, Ontario became the first Canadian community to test water fluoridation, thereby achieving a 54% reduction in decay experienced by 8-year-olds."

"In Quebec, for instance, less than 7% of the population has access to fluoridated water. A study of the oral health of children between 1990 and 1999 found that kindergarten children in Quebec had 40% more cavities than children in Ontario and the United States, and that tooth decay affects 56% of Quebec children in Grade 2."³³

Centers for Disease Control and Prevention:

The CDC named the "fluoridation of drinking water" as one of "10 great public health achievements" of the 20th century.³⁴

C. Everett Koop, M.D., Surgeon General under President Ronald Reagan:

"... I encourage the dental profession in communities which do not enjoy the benefits of an optimally fluoridated drinking water supply to exercise effective leadership in bringing the concentration to within an optimum level."³⁵

Children's Dental Health Project:

"Water fluoridation is particularly beneficial during childhood and in adolescence when cavity experience first begins. Not only do children who drink fluoridated water have fewer cavities but their cavities are smaller and less deep when they do occur."³⁶

Children's Hospital of Denver, Colorado:

In 2008, this hospital was ranked in the top 10 children's hospitals in the U.S.³⁷

"From a public health perspective, to improve the oral health of the people of Colorado the first important step is to fluoridate those public water systems that are as yet non-fluoridated."

Council of State Governments:

"... states need to reduce expenditures in Medicaid budgets and studies have proven that communities benefiting from fluoridated water use fewer Medicaid dollars to treat dental decay.

"... simply by drinking water, everyone, especially those without access to regular dental care, can benefit from fluoridation's cavity protection whether they are at home, work or school."³⁸

David Satcher, M.D., Ph.D., Surgeon General under President Bill Clinton:

"Other evidence of the benefits of fluoridation comes from studies of populations where fluoridation has ceased. Examples in the United States, Germany, and Scotland have shown that when fluoridation is withdrawn and there are few other fluoride exposures, the prevalence of caries increases. In Wick, Scotland, which began water fluoridation in 1969 but stopped it in 1979, the caries prevalence in 5- to 6-year-olds with limited exposure to other sources of fluoride increased by 27 percent between 1979 and 1984. This was despite a national decline in caries ..."³⁹

Early Head Start National Resource Center: <http://www.ehscnrc.org>:

"Fluoride is the most effective agent to prevent tooth decay. It can be added to community water supplies, as needed, and occurs naturally in some areas."

"... Early Head Start staff and parents should be aware that purchased bottled water usually does not contain enough fluoride to prevent tooth decay."⁴⁰

Ernie Mueller, Alaska's former Commissioner of Environmental Conservation:

"I followed [the fluoridation issue] through my 35-year career in water and wastewater research, supervision and management. ... What is disturbing is that the inflammatory and misleading rhetoric used by some of the opponents of fluoridation frightens many people who may not have personal knowledge of the issue."⁴¹

Florida Public Health Institute:

"Fluoride reduces the ability of bacteria to produce acid and promotes the remineralization of enamel, thereby preventing a cavity from continuing to form. Community water fluoridation is a proven cost-effective intervention that optimizes fluoride content in public water systems to promote oral health. Florida's Department of Health supports Community Water Fluoridation."⁴²

GreenFacts.org

(an international organization with a board of scientific advisers):

"The numerous studies carried out in many countries on populations consuming fluoridated drinking water did not show any consistent evidence of an association between the consumption of controlled fluoridated drinking water and increased frequency of cancer."⁴³

Idaho Medical Association:

"The IMA has historically taken a leadership role in public health and safety issues. Its proactive support for polio immunization, public water fluoridation, civil defense planning, cigarette warning labels, use of seat belts, child abuse reporting, motorcycle helmet use, day care licensing, cigarette taxes, minimum drinking age, and immunization of schoolchildren has positively impacted the quality of life and health of all Idahoans."⁴⁴

Indiana State Department of Health:

"Despite the fact that thousands of studies, analyses, and experiments have shown fluoridation to be safe and effective, some insist that it cease until all doubts about its safety have been resolved. Of course, it is impossible to prove the absolute safety of anything. But in the case of fluoridation, opponents are constantly making new allegations, none of which are supported by science."⁴⁵

Indian Health Service (U.S. Dept. of Health and Human Services):

"An effective community water fluoridation program should be the cornerstone of all public oral health programs."⁴⁶

"Recent studies have found a smaller difference in the caries prevalence between optimally fluoridated and fluoride-deficient communities. In American Indian/Alaska Native populations the expected reductions in disease may be even greater, given the high caries rates."⁴⁷

International Agency for Research on Cancer:

"Fluoridation of drinking-water was introduced in the USA in 1950, and thus the studies in the USA encompass periods of observation of 20 years or more. . . . The studies have shown no consistent tendency for people living in areas with high concentrations of fluoride in the water to have higher cancer rates than those living in areas with low concentrations or for cancer mortality rates to increase following fluoridation."

"Since a large number of comparisons were made, some would be expected by chance alone to show differences. However, no consistent difference has been seen, and there have been as many significant negative associations between fluoridated water supplies and cancer incidence or mortality as there have been positive associations."

"... Epidemiological studies have shown no association between the presence of fluorides in drinking-water and the incidence of Down's syndrome."⁴⁸

International Association of Dental Research:

"The International Association for Dental Research (IADR), considering that dental caries (tooth decay) ranks among the most prevalent chronic diseases worldwide . . . and taking into account that over 50 years of research have clearly demonstrated its efficacy and safety; and noting that numerous national and international health-related organizations endorse fluoridation of water supplies; fully endorses and strongly recommends the practice of water fluoridation for improving the oral health of nations."⁴⁹

Irish Forum on Fluoridation:

Note: The Forum on Fluoridation was appointed by Ireland's government to study the impact of water fluoridation on the Irish people. The Forum published its report in September 2002. The very first conclusion of this report is below:

"Water fluoridation has been very effective in improving the oral health of the Irish population, especially of children, but also of adults and the elderly."⁵⁰

Joseph Thompson, M.D., Surgeon General of the State of Arkansas:

"Water fluoridation was trumpeted by the CDC as one of the most important health measures of the 20th century. Now that we are in the 21st century, every community and water system not currently providing this benefit to their residents and customers needs to step up and help their community and its residents."⁵¹

Linus Pauling, winner of the Nobel Prize (1954) and National Medal of Science (1974):

Note: Opponents of water fluoridation often label fluoride as "toxic" or "poison." Linus Pauling debunked this assertion in a 1967 article by writing:

"In this respect, fluoride ion is similar to many other substances, such as vitamin D, that are harmful in large amounts but are required in small amounts for life and good health of human beings."⁵²

Roughly 20 years before he died, Pauling co-founded the Linus Pauling Institute. The Institute has issued this statement on fluoride:

"Although its role in the prevention of dental caries (tooth decay) is well established, fluoride is not generally considered an essential mineral element because humans do not require it for growth or to sustain life. However, if one considers the prevention of chronic disease (dental caries) an important criterion in determining essentiality, then fluoride might well be considered an essential trace element."⁵³

Massachusetts Dental Society:

"...we also have come to realize that the issue of fluoride, to some, is less about science and more about emotion. The groups and individuals questioning the safety of fluoride tend to forget that many dentists are parents, too. Why would we advocate for water fluoridation if we believed that it would be compromising our own children's health in any way?"⁵⁴

Michigan Department of Community Health:

"Community water fluoridation has proven to be safe through both practical experience and research. During the past 40 years, over 4,000 studies have measured and confirmed the safety of fluoride. Community water fluoridation has been studied more thoroughly than any other public health measure."⁵⁵

Michigan State Medical Society:

"The Michigan State Medical Society, in cooperation with the Michigan Association of Public Health and Preventive Medicine Physicians, is urging citizens and public water facilities throughout the state not to misinterpret the new [federal] recommendations regarding the fluoridation of municipal water."

"... the FDA believes that reducing the level of fluoride in municipal water will help reduce the occurrence of dental fluorosis, a harmless discoloration (mottling) that can occur with higher levels of exposure to fluoride. Fluoridation of water can decrease cavities by up to 40% if available to children during the first 7 years of their lives. The value of fluoridation has been thoroughly established as safe and effective."⁵⁶

Mississippi State Department of Health:

"Water fluoridation is an effective, safe and inexpensive way to prevent tooth decay. ... In Mississippi, the cost of water fluoridation is usually between one and two dollars per person per year and saves \$16-\$19 per person per year in dental treatment costs."⁵⁷

National Consumers League:

"Bottled water consumption has doubled over the past decade and as a result, the exposure to fluoride from tap water, which can not only prevent tooth decay, it can repair tooth decay, has been reduced as well."

"Oral health is a critical component of overall health, and we need to spread the word about the importance of brushing with fluoridated toothpaste twice a day, drinking tap water wherever possible, and seeing the dentist twice a year. The benefits will pay off exponentially."⁵⁸

National Council Against Health Fraud:

"Antifluoridationists who point out that fluoride can produce adverse effects deliberately fail to mention that the concentrations that produce adverse effects [are] higher than the concentration produced by properly maintained fluoridation systems."

"... NCAHF believes that the factions that keep alive the antifluoridation movement are a major detriment to the health and well-being of the public."⁵⁹

National Dental Association:

"As a result of water fluoridation half of all children ages 5 to 17 have never had a cavity in their permanent teeth. Despite the overwhelming evidence of the value of water fluoridation 34% of the population still does not have access to fluoridated water. Water fluoridation would save over \$1.5 billion per year."⁶⁰

National Fluoride Information Centre (United Kingdom):

Note: Many anti-fluoridation activists tell the public that "Europe doesn't fluoridate." Although it is true that water fluoridation is not common in Europe, this argument is very misleading because there are other ways, such as fluoridating salt and milk, that many European countries provide fluoride to their citizens:

"Salt fluoridation was introduced in Switzerland in 1955 and it is now estimated that fluoridated salt is available to nearly 200 million people worldwide, including Europe, Central and South America and the Caribbean. It is the preferred method of fluoridation on mainland Europe and is widely available in France, Germany, Switzerland, Austria, Belgium, Spain, Czech Republic and Slovakia."⁶¹

In addition, millions of Irish and English drink fluoridated water:

"Five and a half million people in England drink artificially fluoridated water. In these areas the children have among the lowest levels of tooth decay in the country. Recent independent research at the University of York has confirmed the benefits of fluoridation. Fluoridation works best in large towns with a simple water supply and where the children have high amounts of dental decay. People living in Birmingham and Newcastle have been drinking fluoridated water for more than 30 years."⁶²

National Institute of Dental and Craniofacial Research:

"Although dental caries remains a public health worry, it is no longer the unbridled problem it once was, thanks to fluoride."⁶³

National PTA (Parent-Teacher Association):

"PTA involvement laid the groundwork for cooperative partnerships with medical associations and health organizations in the decades to come. ... [PTA also worked] to educate members about other immunizations and treating water with fluoride to prevent rampant dental problems."⁶⁴

Nevada State Medical Association:

"... the NSMA and its component medical societies support legislative efforts to promote community water fluoridation at optimal levels to decrease the incidence of dental caries."⁶⁵

Oklahoma State Department of Health:

"It is recommended that all public water systems in Oklahoma be fluoridated to provide this cost-effective oral disease prevention measure to residents throughout Oklahoma."⁶⁶

Oral Health America:

"Oral Health America enthusiastically supports community water fluoridation. Fluoridated water supplies give Americans, especially those most vulnerable, equal access to one of the most celebrated public health measures of our time. Fluoridation brings healthy mouths to life."⁶⁷

Oregon Medical Association:

"OMA recognizes the health benefits of fluoridation and has long stood in support of fluoridating public water supplies."

"OMA reaffirms its support for fluoridation of all public water supply systems ..."⁶⁸

Pew Center on the States:

"Fluoride counteracts tooth decay and strengthens the teeth by fighting harmful acids and drawing calcium back into the teeth. Community water fluoridation can reduce tooth decay in children by up to 60 percent, and it costs as little as \$1 per person, per year.

"Research shows that community water fluoridation offers perhaps the greatest return-on-investment of any dental care strategy. The reduction in just the costs of filling and extracting diseased teeth (not counting reductions in lost work time and dental pain) more than makes up for the cost of fluoridation."

Public Health Law Research (Temple University):

"Fluoride is a mineral that has been proven effective at preventing tooth decay."

"... In the judgment of a Community Guide expert panel, there is significant evidence to support water fluoridation as an effective public health intervention aimed at reducing tooth decay."⁶⁹

Richard H. Carmona, M.D., Surgeon General under President George W. Bush:

"Water fluoridation is a powerful strategy in our efforts to eliminate differences in health among people and is consistent with my emphasis on the importance of prevention.

"... Fluoridation is the single most effective public health measure to prevent tooth decay and improve oral health over a lifetime, for both children and adults."⁷⁰

Robert Wood Johnson University Hospital:

"Fluoride, either applied topically to erupted teeth, or ingested orally (called systemic fluoride) during tooth development, helps to prevent tooth decay, strengthen tooth enamel, and reduce the harmful effects of plaque."⁷¹

Tennessee Department of Health:

"Fluoride is naturally occurring and present in all bodies of water (rivers, lakes, springs, and wells) to some degree. Water fluoridation is the adjustment of the natural level of fluoride to a level that is optimal for oral health.

"... More than 60 years of research supports the fact that community water fluoridation is both safe and effective."⁷²

Texas Department of State Health Services:

"The wide implementation of community water fluoridation in Texas has resulted in substantial savings in publicly financed dental care under the Texas Healthy Steps (EPSDT-Medicaid) program. Further savings may be made by implementing community water fluoridation in areas where it is lacking and feasible."⁷³

United Methodist Health Ministry Fund:

"Since 1998, the Health Fund has offered grants to fund the start-up costs of community water fluoridation due to fluoridation's time-proven oral health benefits, safety, and practicality. Persons living in communities with fluoridated water enjoy 20 to 40% less tooth decay than those in areas without adequate fluoride."⁷⁴

U.S. Task Force on Community Preventive Services:

"The Task Force on Community Preventive Services recommends community water fluoridation based on strong evidence of effectiveness in reducing tooth decay."⁷⁵

Utah Health Department:

"The nationwide goal to prevent cavities through community water fluoridation is similar to previous public health efforts to prevent other common health problems. These include adding iodide to salt to prevent thyroid problems, adding iron to infant formula to prevent anemia, adding Vitamin D to milk to prevent rickets, adding niacin to flour and other foods to prevent pellagra, and adding folic acid to cereal grains products to prevent birth defects.

"Each of these public health efforts represents situations where a nutritional additive is provided to everyone or to large target populations since it is impossible to individually identify and effectively treat the significant number of people who are at risk."⁷⁶

Vermont Medical Society:

"... frequent exposure to small amounts of fluoride enhances developing enamel and encourages remineralization, replacing minerals that bacteria dissolve from the enamel surface of teeth."

"... the Vermont Medical Society endorses fluoridation as an important community commitment to the oral health of its children and adults and it affirms the value of continuing fluoridation in community water systems."⁷⁷

Washington State Public Health Association:

"... the benefits of fluoridation of water in the prevention of dental disease have been scientifically substantiated."

"... the Washington State Public Health Association actively endorses and strongly supports fluoridation of the public water systems in the State of Washington."⁷⁸

WebMD.com:

"Fluoride helps prevent tooth decay by making the tooth more resistant to acid attacks from plaque bacteria and sugars in the mouth. It also reverses early decay. In children under six years of age, fluoride becomes incorporated into the development of permanent teeth, making it difficult for acids to demineralize the teeth. Fluoride also helps speed remineralization as well as disrupts acid production in already erupted teeth of both children and adults."⁷⁹

Wisconsin Oral Health Coalition:

"... community water fluoridation is a significant cost containment measure available for dental caries prevention in communities throughout Wisconsin, costing an average of approximately 50 cents per person per year while reducing the need for expensive treatment ..."⁸⁰

World Health Organization:

"Fluoride is being widely used on a global scale, with much benefit. Millions of people worldwide use fluoridated toothpaste. They benefit from fluoridated water, salt fluoridation or other forms of fluoride applications ..."⁸¹

Sources

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2. Cynthia Sherwood, DDS, FAGD, a spokesperson for the Academy of General Dentistry is quoted at: "Advocacy: Drinking Tap Water May Help You Avoid Dentist's Drill," Academy of General Dentistry, March 2010, accessed on February 11, 2011 at <http://www.agd.org/public/oralhealth/Default.asp?IssID=303&Topic=F&ArtID=7363#body>.
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Is Water Fluoridation Still Necessary?

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Water fluoridation has been promoted in many countries as an organized community effort to control dental caries. With the availability of fluorides targeted at individuals and the decline in dental caries, the need for fluoridation has been questioned. Recent reports show that water fluoridation, a community-level intervention, continues to be an efficient method for the delivery of fluoride in many countries. The advantages include its ability to deliver low levels of fluoride to saliva frequently, with high reach, at low cost, and with substantial cost savings. Water fluoridation has the potential to reduce oral health disparities by creating a healthy environment. Other forms of fluoride, such as fluoride toothpaste, and clinical interventions complement dental caries control strategies.

Introduction

Fluoridation has been promoted in many countries as an organized community effort to meet the health, economic, and societal challenges of dental caries (Clarkson and McLoughlin, 2000; Petersen and Lennon, 2004; Jones *et al.*, 2005). It is adopted because the underlying problem is widespread, the disease burden is distributed unfairly, the evidence of preventive intervention is strong, and alternative strategies are not reaching those who need them the most. This approach complements other self-applied fluoride strategies and clinical interventions designed to control dental caries. Other approaches, such as health education efforts to bring about changes in individual behavior and dietary control, have not shown impressive results (Kay and Locker, 1996).

Foods and beverages have been used as vehicles for delivering nutrients and minerals for many decades. The addition of folic acid to cereals and grains for eliminating neural tube defects is a prime example. Policies pursued by different countries to use these vehicles for addressing public health problems vary, depending on the disease burden, health priorities, political philosophy, economic situation, health care system, and feasibility. While fortification of cereals and grains with folic acid has been mandated in the United States since 1996, many European countries have been slow to adopt this (Oakley, 2002). Similarly, policies regarding the selection of fluoride as a preventive modality vary widely across different countries. For example, Vietnam has recently undertaken efforts to promote fluoridation, whereas it has been discontinued in the former East Germany. While Switzerland and some South American countries have promoted salt fluoridation, Scandinavian countries have relied on school-based programs (Jones *et al.*, 2005; Marthaler and Petersen, 2005).

The question posed in this symposium is fair, because all public health interventions should be periodically re-examined. Caries in children has declined in the absence of fluoridation in some countries. Our thinking about fluoride's mechanisms of action has changed. The effect of fluoride is considered primarily, though not exclusively, post-eruptive (CDC, 2001). A

narrowing in the difference in caries rates between fluoridated and non-fluoridated communities has been observed. Many other forms of fluorides are now available, especially fluoride toothpastes in developed countries. To answer the question posed in this symposium, I undertook a review to examine the issues mentioned above, with particular relevance to fluoridation policy in the United States. Healthy People 2010, a set of national health objectives, calls for at least 75% of the population served by community water systems to receive optimal levels of fluoride (US Department of Health and Human Services, 2000b).

Although dental caries experience has declined in the United States, it still affects a large proportion of the population (Beltran-Aguilar *et al.*, 2005), and it is the most common chronic childhood disease. Almost 20% of 2- to 5-year-old children experience caries. Among 16- to 19-year-old children, the average number of decayed, missing, and filled surfaces is 5.8. Adults 40 to 59 years of age have an average 42 decayed, missing, and filled surfaces (DMFS). Only about 50% of children visit a dentist annually. The societal cost is enormous, since dental diseases account for 30% of all health care expenditures in children (US Department of Health and Human Services, 2000a). In general, the disease burden is higher among the poor and minorities. This assumes greater importance when one considers that one in four children in the United States lives in poverty.

Effectiveness of fluoridation

Several recent and authoritative reviews conducted in the US, Australia, the UK, and Ireland provide evidence of the effectiveness of water fluoridation under modern conditions (McDonagh *et al.*, 2000; Government of Ireland, 2002; Truman *et al.*, 2002; National Health and Medical Research Council, 2007). Two systematic reviews are examined here to quantify the effect of water fluoridation (Table 1). The National Health Centre for Reviews and Dissemination, University of York, concluded that the best available evidence suggested that fluoridation of drinking water supplies reduced dental caries prevalence, as measured both by the proportion of children who are caries-free and by the mean reduction in the decayed, missing, and filled teeth (dmft/DMFT) score (McDonagh *et al.*, 2000).

An independent Task Force convened by the Centers for Disease Control and Prevention (CDC), which developed the *Guide to Community Preventive Services*, found strong evidence that water fluoridation is effective in reducing the cumulative caries experience (Truman *et al.*, 2002). The Task Force computed estimates of effectiveness based on three groups of studies. In studies examining the 'before and after' measurements of caries at the tooth level, starting or continuing fluoridation decreased dental caries experience among children

Key Words

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TABLE 1. Effectiveness of Fluoridation as Estimated in Two Systematic Reviews

Review	Reviewed Studies' Characteristic	Interest Outcomes	Outcome Changes: Median (range)
National Health Centre for Reviews and Dissemination ^a	Before/after community water fluoridation (CWF)	Changes in caries prevalence Differences in dmft/DMFT	-15%* (-64%, 5%) -2.25 (-0.5, -4.4)
The Community Guide ^b	Before/after	Changes in caries at the tooth level (deft/DMFT) Effect of starting or continuing CWF Effect of stopping CWF	-29.1% (-110.5%, 66.8%) 17.9% (-42.2%, 31.7%)
	After measure only	Changes in caries at the tooth level (deft/DMFT) Effect of starting or continuing CWF Effect of stopping CWF	-50.7% (-68.8%, -22.3%) 59.9%

* Negative values reflect decrease in caries.

^a McDonagh *et al.* (2000).

^b Truman *et al.* (2002).

aged 4 to 17 years by a median of 29.1% during 3 to 12 years of follow-up. Stopping fluoridation was associated with a median increase of 17.9% increase in dental caries during 6 to 10 years of follow-up. In studies that examined only post-exposure measurements of caries at the tooth level, starting or continuing fluoridation decreased dental caries experience among children aged 4 to 17 years by a median of 50.7% during 3 to 12 years of follow-up.

Several recent reports in the United States show that the difference in dental caries between fluoridated and non-fluoridated communities is still noticeable, despite the ubiquitous presence of fluoride in food, water, and dental products (Jackson *et al.*, 1995; Selwitz *et al.*, 1995, 1998; Kumar *et al.*, 2001). Additional supportive evidence comes from studies conducted in Australia and Ireland (Slade *et al.*, 1995, 1996; Government of Ireland, 2002; Armfield, 2005; Hopcraft and Morgan, 2006).

Although the benefit of water fluoridation is measured in terms of caries averted, there are many intangible benefits. There is a general impression that the progression of caries is delayed in the presence of fluoride, thereby providing more time for undertaking restorative treatment, when compared with 50 years ago (Lawrence and Sheiham, 1997). The disease in children is also now less complex to treat, since most of the lesions are in pits and fissures (Brown and Selwitz, 1995). The benefits continue into adulthood (Griffin *et al.*, 2007).

Diffusion effect

Another advantage of fluoridation is that even persons in non-fluoridated areas also receive fluoride through beverages and foods originally processed in fluoridated areas (Pang *et al.*, 1992). This diffusion of fluoride through beverages and foods is thought to provide an explanation for the diminished difference in caries observed in recent years between fluoridated and non-fluoridated communities (Ripa, 1993; Griffin *et al.*, 2001a). In a United States national survey, the mean DMFS of 5- to 17-year-old children with continuous residence in fluoridated areas under modern conditions of fluoride exposure was about 18% lower than that in children with no exposure to fluoridation (Brunelle and Carlos, 1990). The mean DMFS difference in the 5- to 17-year-old children amounted to almost 61% in the Western region of the United States, where the fluoridation penetration was only 19%. In regions where the fluoridation reached greater than 50%, the difference was much smaller or difficult to observe. The diffusion effect has been quantified by measurement of the differences in mean DMFS between and among communities with different diffusion exposures (Griffin *et al.*, 2001a). This analysis showed that a direct comparison of mean DMFS between fluoridated and non-fluoridated communities underestimated the effectiveness of water fluoridation. This has important implications for the discontinuation of water fluoridation, since caries levels would

rise not only in fluoridated communities, but also in non-fluoridated communities if the fluoride exposure levels were not maintained.

Cost and savings

The more relevant issue now is to examine if water fluoridation results in cost savings. An analysis of cost savings is primarily based on the cost of water fluoridation and the costs of disease averted, including productivity losses averted. Many factors—such as equipment, construction, chemicals, and labor—affect the cost of fluoridating a community (Griffin *et al.*, 2001b). The size of the community and the number of injection points are the major determinants. According to the *Guide to Community Preventive Services*, the estimated median cost *per person per year* in the United States ranged from \$2.70 for systems serving ≤ 5000 to \$0.40 for systems serving ≥ 20,000 people (Truman *et al.*, 2002).

The National Preventive Dentistry Demonstration Program concluded that water fluoridation was the most cost-effective means of reducing tooth decay in children. The reductions in decay attributable to water fluoridation were almost the same as those obtained with sealants, but at a much lower cost (Klein *et al.*, 1985). The annual *per person* cost savings, in 1995 dollars, from water fluoridation has been estimated for communities of different sizes by various parameters, such as effectiveness, annual caries increment, average discounted lifetime cost of a carious surface, and cost of fluoridation (Griffin *et al.*, 2001b) (Table 2). This analysis assumed that there are no adverse effects from fluoridation. The number of carious surfaces saved that is attributable to foregoing one year of water fluoridation is estimated to be 0.04, 0.19, and 0.34, for worst-, baseline, and best-case scenarios (in terms of effectiveness), respectively. Using similar methods, O'Connell *et al.* (2005) estimated that

TABLE 2. Annual per Person Cost Savings (in 1995 dollars) (negative net cost) from Water Fluoridation in the United States

Community Size (population)	Best Case*	Baseline	Worst Case
< 5000	\$31.04	\$15.95	\$0.85
5000-9999	\$32.57	\$17.48	\$2.38
10,000-20,000	\$33.15	\$18.06	\$2.96
≥ 20,000	\$33.71	\$18.62	\$3.52

* The numbers of carious surfaces attributable to foregoing one year of water fluoridation exposure are 0.34, 0.19, and 0.04 surfaces for best-, baseline, and worst-case scenarios, respectively. The estimated annual *per person* water fluoridation costs for communities of various sizes varied from a low of \$0.50 to a high of \$3.44. For a community with a population > 20,000, the return on investment was calculated based on the baseline scenario: total savings (\$18.62 + \$0.50)/cost of fluoridation provided by the author (\$0.50) = \$38 (1995 US dollars) (Griffin *et al.*, 2001b).

the fluoridation program in Colorado was associated with an annual saving of \$148.9 million (credible range, \$115.1 to 187.2 million) in 2003, or an average of approximately \$61 per person (O'Connell *et al.*, 2005). Similar results have also been observed in New Zealand (Wright *et al.*, 2001). The impact of fluoridation on the cost of publicly financed treatment programs has also been reported from Texas and Louisiana (CDC, 1999; Texas Department of Health, 2000).

Mechanism

The improved understanding of the mechanisms of fluoride action has led to the conclusion that the predominant action of the fluoride is in the processes of remineralization and inhibition of demineralization of enamel (Featherstone, 1999, 2000). While this mechanism was not well-understood when fluoridation was introduced, the post-eruptive benefits were recognized even in the early epidemiological studies of fluoridation (Ast *et al.*, 1956). For example, the percent of caries-free first permanent molars that had already erupted in 16-year-olds when fluoridation was initiated in Newburgh was 8.5, compared with 4.8 in non-fluoridated Kingston. There were also fewer missing first permanent molars in Newburgh. These initial studies suggested that there were beneficial effects on teeth that were formed or erupted prior to the initiation of water fluoridation (McClure, 1970). While the post-eruptive benefits are acknowledged, it is the pre-eruptive benefits that are debated, especially in the context of fluoride supplement use.

The relative beneficial effects of pre- and post-eruptive exposure have been studied in Australian children (Singh *et al.*, 2003; Singh and Spencer, 2004). The results suggested an important pre-eruptive caries-preventive effect and supported continuous exposure for the best outcome. The authors noted that a thin fluorapatite coating on the surfaces of hydroxyapatite crystals could lead to decreased solubility of enamel. This finding supports that of an earlier study, conducted in India, which examined trends in dental caries attack rates in permanent first molars after the source of fluoride was changed from higher (0.9 to 2.0 mg/L) to lower (0.19 mg/L) in three villages (Kaur *et al.*, 1987). Remarkably, older children, who had relatively more pre-eruptive exposure and little post-eruptive exposure, had better outcomes. Because studies to separate the pre-eruptive effects from the post-eruptive effects are difficult to design and conduct, this debate will probably continue without further epidemiological studies. Regardless of the predominant mechanism of action, water is an efficient vehicle for delivering a low concentration of fluoride at high frequency.

Disparities in health and social equity

In the early part of the last century, dental caries was considered a disease of the rich, due in part to their greater access to refined sugar. An analysis of the WHO database suggested that a pattern of change in caries prevalence has emerged (Peterson, 2003), showing that caries has declined in many industrialized countries, but has increased in some developing countries. With the introduction of fluoride, improved oral hygiene practices, and early restorative care, dental caries trends show a substantial decline in many industrialized countries. Because not all segments of the society benefited equally from the improvement in oral health, dental caries has now become a disease of the poor in most Western countries. Reducing or eliminating oral health disparities is a goal for many countries.

The National Health Centre for Reviews and Dissemination at the University of York examined whether fluoridation reduced dental caries across social groups in Britain (McDonagh *et al.*, 2000). Using the dmft/DMFT measure, the authors noted that there appeared to be some evidence that water fluoridation reduced the inequalities in dental health across social classes in 5- and 12-year-olds, but not the proportion of caries-free

children among 5-year-olds. Several other investigators in Australia, New Zealand, and the United States have reported that disadvantaged children have the worst outcome in the absence of water fluoridation (Slade *et al.*, 1996; Kumar *et al.*, 1998; Wright *et al.*, 2001). More recently, a study found that, while everyone living in fluoridated areas in New South Wales had lower caries experience, indigenous people, who represent one of the most marginalized and disadvantaged segments of the Australian population, benefited more from water fluoridation (Armfield, 2005).

Enamel fluorosis and water fluoridation

The only known risk associated with the ingestion of fluoridated water is the occurrence of milder forms of enamel fluorosis (McDonagh *et al.*, 2000). In the United States, the decline in dental caries has also been accompanied by an increase in the prevalence of enamel fluorosis, in both fluoridated and non-fluoridated communities (Rozier, 1999). Several steps have been taken to reduce fluoride exposure from various sources. These include: a reduction in the fluoride content in infant formulas; the introduction of low-concentration fluoride toothpastes for children in Australia and Europe; downward adjustment of fluoride in water in Hong Kong, Canada, and Ireland; and downward adjustments in fluoride supplement regimens. Studies in Hong Kong and Australia have observed a reduction in the prevalence of dental fluorosis pursuant to specific changes in fluoride exposure (Evans and Stamm, 1991; Riordan, 2000). In the United States, a clear population threshold exists for severe enamel fluorosis, such that the occurrence of the advanced form of fluorosis is close to zero in areas where the fluoride level in drinking water is below 2 mg/L (National Research Council, 2006).

Discussion

Water fluoridation is a population-level strategy for preventing dental caries. As such, it has broad reach in the population, with demonstrated safety, effectiveness, and low cost. Fluoridation delivers sustainable level of fluoride to the oral environment on a frequent basis in an inexpensive way. The return on investment is attractive in most communities, even under the assumptions of worst-case scenario regarding its effectiveness and cost.

Water fluoridation is still necessary for promoting good oral health, since changes in individual behaviors are difficult to accomplish, especially among certain segments of society (Burt, 2002). The alternative strategies, such as supervised toothbrushing in schools, are difficult to implement and sustain. While randomized clinical trials show strong evidence for promoting toothpaste use, these findings are difficult to generalize to diverse community settings. A recent systematic review of toothpaste clinical trials showed that the annual mean increment in the control group where it was tested ranged from 1.14 DMFS to 7.66 DMFS (Marinho *et al.*, 2003). In contrast, economic analyses have been conducted based on annual caries increments of 0.33 to 1.16 DMFS observed in the United States (Griffin *et al.*, 2001b). The return on investment is significant, even when the caries-preventive effectiveness is modest. Analyses of the National Preventive Dentistry Demonstration Program data showed that dental health lessons, brushing and flossing, fluoride tablets and mouthrinsing, and professionally applied topical fluorides were not effective in reducing a substantial amount of dental decay, even though many of these interventions have been shown to be effective in clinical trials. Water fluoridation was shown to prevent as much decay as the placement of dental sealants (Klein *et al.*, 1985).

The studies of the effectiveness of water fluoridation have been based on observational study designs. As such, these studies are considered lower in quality. However, the weight of evidence derived from the observational studies conducted

in diverse population groups provides convincing evidence of the effectiveness of water fluoridation.

Discussions about fluoridation of a particular community should be viewed in the context of available caries-prevention strategies and focused on the disease burden, feasibility, cost, and utilization of other forms of fluoride. Similarly, discussions concerning cessation of fluoridation should consider the impact of removing the intervention from socially disadvantaged groups within the community.

The title of this paper asks whether water fluoridation is still necessary. At present, fluoridation remains the best tool to combat caries in many countries. Another way to consider the question is to ask, What evidence is there to show fluoridation to be unnecessary in the countries where it is widely practiced? An alternative strategy for preventing dental caries across all social strata in the population has not emerged, while the costs of treatment have not declined.

Measuring the impact of interventions to control dental caries is difficult, because it is characterized by a complex interaction of multiple risk factors. Documenting the impact of fluoridation is even more challenging, because the immediate impact is not apparent. Therefore, research should continue to assess its impact and to determine the appropriate level of fluoride in water to balance the benefits of fluoride against the risks of enamel fluorosis in any one country. Similarly, surveillance and research activities should continue to assess the effect of total fluoride exposure. Promising new approaches to eliminate dental caries as a public health problem should be pursued.

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