



## Response to "Fluorine Nation" Letter

The letter "Fluorine Nation," which is being widely distributed to state and local health officials, exhibits many of the tactics of fluoridation opponents, including failure to verify the validity or accuracy of their information, misrepresentation of science, cherry-picking the scientific literature, presenting unsubstantiated claims, and willfully misleading the public. The letter demonstrates a lack of basic understanding of the public health initiative of water fluoridation and the science behind it.

The following is a point-by-point explanation of the fallacies of this letter, followed by a list of cost-effectiveness studies and a list of references cited within this paper.

First, it is notable to point out that, throughout the letter, the authors exhibit a lack of understanding of basic chemistry by failing to differentiate between the element fluorine and its anion fluoride. Fluorine is a naturally occurring element. It exists in abundance in the Earth's crust—mainly in gaseous form. Fluoride is a negatively charged atom (anion) of fluorine. The fluoride ion is the component involved in water fluoridation, not the element fluorine.

The fluoride ion has existed in water virtually always—in rivers, lakes, groundwater and the ocean. As groundwater passes over rocks, it picks up fluoride ions leached from the compound calcium fluoride and fluorosilicate compounds in those rocks. These fluoride ions are what is commonly referred to as "naturally occurring fluoride".

### **1. Letter: "To continue to advise that public water authorities add fluorine in any form to public water supplies is a disservice to the public".**

#### Facts:

Often fluoridation opponents will claim that "naturally occurring" fluoride is calcium fluoride which they claim is "safer" than the fluoride added through fluoridation. This is incorrect. Calcium fluoride does not exist in groundwater. The fluoride ions added through fluoridation are identical to the "naturally occurring" fluoride ions which have always existed in our water. A fluoride ion is a fluoride ion, regardless of from what compound it is released. Fluoridation simply raises the level of those existing fluoride ions by a minuscule level up to that level at which maximum dental decay prevention will occur, while maintaining that level well below the threshold of adverse effects.

### **2. Letter: "American dentistry says that every \$1.00 spent on CWF [Community Water Fluoridation] will save \$38.00 in dental expense"**

#### Facts:

The \$1/\$38 refers to a 2001 study by health economist Susan Griffin, et al. which concluded the total amount saved from dental treatment and loss of productivity resultant of dental decay is \$38 per every \$1 spent on water fluoridation. **(1)**

**3. Letter: "Ko and Thiessen have effectively studied this calculation and presented their findings in 2014. The research presented shows, errors in assumptions, points out the decline in caries prior to CWF, and in general, shows that cherry-picking the data, the Pro-F argument ignores costs ancillary to CWF including the actual costs of injecting fluorine by whatever method, the purchase cost of the fluorine, and the eventual need for cosmetic treatment of dental fluorosis."**

Facts:

A. Kathleen Thiessen is a long-time, outspoken fluoridation opponent

B. Fluorine is not "injected" into water. This was the reason a cost for so doing was not included in Griffin's calculations.

Fluoridation compounds are added to water in order to deliver the amount of fluoride ions necessary to raise the existing level of those ions up to the optimal level where maximum dental decay prevention will occur, with no adverse effects. Once the fluoridation substance has degraded into fluoride ions and barely detectable trace contaminants, that substance no longer exists in that water. It does not reach the tap and is thereby not ingested.

The fluoridation substance most widely utilized to deliver fluoride ions into water is hydrofluorosilicic acid (HFA). Griffin did indeed include comprehensive costs for equipment, consulting fees, installation, maintenance, and chemicals.

*From Griffin, et al:*

"Cost data for water fluoridation were obtained from a published study that reported the one-time fixed costs and annual operating costs for 44 Florida communities that implemented community water fluoridation in the 1980s (31). All costs were reported in 1988 US dollars. One-time fixed costs included equipment, installation, testing equipment, safety equipment, and consultant engineering fees. All equipment was assumed to have a useful life of 15 years and no salvage value. Annual operating costs included chemicals, labor, and maintenance. Chemical costs (all but two of the systems used hydrofluosilicic acid) covered an increase in fluoride from <0.3 ppm to 0.8 ppm. We annuitized the one-time fixed costs over 15 years using discount rates of 4 percent (base case), 0 percent (best case), and 8 percent (worst case). All costs were converted to 1995 US dollars with use of the CPI-U (33) (Table 3)." (1)

C. The only dental fluorosis in any manner attributable to optimally fluoridated water is mild to very mild, a barely detectable effect which causes no adversity on cosmetics, form, function, or health of teeth. As peer-reviewed science has demonstrated mildly fluorosed teeth to be more decay resistant, many consider this effect to not even be undesirable, much less adverse. This level of dental fluorosis requires no treatment. Therefore, there are no costs for any dental treatment for it. (12)

In her calculations, Thiessen included costs for treating severe dental fluorosis with expensive veneers and crowns, claiming that these costs negated any cost savings from CWF. Severe dental fluorosis does not occur in association with fluoride levels of 2.0 parts per million, or less,

in water. Water is fluoridated at 0.7 parts per million. Therefore, Thiessen's inclusion of these costs was a complete misrepresentation.

*From Ko, Thiessen:*

"Dental fluorosis is classified by the severity of the discoloration, the presence of pitting, and the extent of the tooth surfaces affected.<sup>44,45vii</sup> Although bleaching and microabrasion can be used to improve the appearance of milder cases of fluorosis, moderate and severe dental fluorosis can require extensive treatment to improve the cosmetic appearance and prevent further loss of enamel.<sup>44,45</sup> Treatment options include applications of veneers or crowns. Porcelain veneers may cost more than composite resin veneers (\$800–\$2,500 vs. \$250–\$1,500), but they require less frequent replacement (10–15 vs. 5–7 years).<sup>52,53</sup>" (2)

Thiessen's misrepresentation is all the more egregious given the fact that she was fully aware that severe dental fluorosis does not occur below the level of 2.0 ppm. From the 2006 NRC Committee on Fluoride in Drinking Water of which Thiessen was one of the 12 members of that Committee which extensively reviewed the fluoride literature:

*From the 2006 NRC:*

"The prevalence of severe enamel fluorosis is close to zero in communities at all water fluoride concentrations below 2 mg/L. Above 2 mg/L, the prevalence rises sharply. The shape of this curve differs dramatically from the linear trend observed when all levels of fluorosis severity are combined and related to either the water fluoride concentration (Dean 1942) or the estimated daily dose in milligrams per kilogram (Fejerskov et al. 1990)." (3)

D. The claim that fluoridation advocates have "Cherry-picked data" is ironic given the fact that they present but one, single flawed study, Ko/Thiessen", as evidence of lack of cost-effectiveness, while ignoring the volume of peer-reviewed science which clearly demonstrates the exact opposite. A list of a number of fluoridation cost-effectiveness studies is provided at the end of this report.

#### **4. Letter: "it is illegal to add fluorine compounds to the water in Israel and the Netherlands"**

*Facts:*

A. The temporary cessation of fluoridation in Israel was due to the unilateral action of but one, single individual, the former Israeli Minister of Health, Yael German, a long time antifluoridationist. This misguided decision was vehemently opposed by the highly respected Israeli healthcare community, the very ones on whom German should have relied for proper recommendations. Even Prime Minister Netanyahu himself disagreed with this decision. With the ouster of Minister German, her replacement has reversed her decision and is currently in the process of resuming fluoridation for that country. (4)

B. In 1973 the Netherlands court ruled the addition of fluoride to water to have no legal basis under Netherlands law. This was simply a ruling on a point of law, not on the safety or effectiveness of fluoridation.

"Water was fluoridated in large parts of the Netherlands from 1960 to 1973, when the High Council of The Netherlands declared fluoridation of drinking water unauthorized. Dutch authorities had no legal basis for adding chemicals to drinking water if they would not improve

the safety of doing so. Drinking water has not been fluoridated in any part of the Netherlands since 1973." (5)

C. It's ironic that fluoridation critics would point to the Netherlands because it was here that one of Europe's earliest controlled-trial fluoridation studies was conducted. Researchers examined tooth decay trends in two Dutch cities, only 10 miles apart, and published their findings in 1961. After more than six years of fluoridation, the study's co-authors observed "an important [cavity] inhibiting effect" and "a clear-cut difference which favours Tiel (the fluoridated city)." It's worth noting that the co-authors were not predisposed to endorse fluoridation. In fact, they were affiliated with the Organization for Health Research, which stated in 1951 that it was premature to fluoridate water in the Netherlands because the earliest fluoridation studies in the U.S. might not be relevant given perceived differences in Dutch health and dietary habits. (6)

#### **5. Letter: Peckham and Aofeso, in 2014....."**

##### Facts:

Peckham and Awofeso are two, long time antifluoridationists. Peckham is the former Chair of the British antifluoridation group called "Hampshire Against Fluoride". Their opinions are biased and without merit.

#### **6. Letter: "CWF offers no dose control over how much fluorine a citizen ingests"**

##### Facts:

A. Fluorine is not ingested in fluoridated water. The only substances ingested as a result of fluoridation are fluoride ions, identical to those which have always existed in water, and trace contaminants in barely detectable amounts far below US EPA mandated maximum allowable levels of safety.

B. There is indeed strict control over the "dose" of fluoride from fluoridated water. It is non-fluoridated systems which have no control.

Simply put, water is fluoridated at 0.7 mg/liter (ppm=mg/liter). Thus, for every liter of fluoridated water consumed, the "dose" of fluoride intake is 0.7 mg. The average daily water consumption by an adult is 2-3 liters per day. The CDC estimates that of the total daily intake, or "dose", of fluoride from all sources including dental products, 75% is from the water.

The Institute of Medicine has established that the daily upper limit for fluoride intake from all sources, for adults, before adverse effects will occur, short or long term, is 10 mg.

The range of safety between the minuscule few parts per million fluoride that are added to existing fluoride levels in water and the daily upper limit, is so wide that "dose" is not an issue. Before the UL of 10 mg could be reached, water toxicity would be the concern, not fluoride.

The daily upper limit of fluoride intake from all sources is far less for infants and children 0-8 years, but only due to risk of mild to very mild dental fluorosis during those teeth developing years. After the teeth have developed, dental fluorosis is longer possible. Thus, after age 8 the daily upper limit jumps to 10 mg. (7)

**7. Letter: "There is no optimum amount and fluorine is not a nutrient needed by humans in any form"**

Facts:

False on both counts.

A. The optimal level of fluoride is, by definition, the recommended concentration of fluoride in water at which maximum dental decay prevention will occur, with no adverse effects. The optimal level is 0.7 parts per million, and is an official recommendation of the US Department of Health and Human Services.

B. From the scientific literature:

*"This report focuses on five nutrients—calcium, phosphorus, magnesium, vitamin D, and fluoride, all of which play a key role in the development and maintenance of bone and other calcified tissues."*

---Institute of Medicine (US) Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride. Washington (DC): National Academies Press (US); 1997. Preface.

*"Fluoride is regarded as an essential nutrient now well known to be effective in the maintenance of a tooth enamel that is more resistant to decay."*

---Fluoride as a Nutrient  
American Academy of Pediatrics  
Committee on Nutrition  
Pediatrics, vol. 49, No 3, March 1972

*"Fluoride is a normal constituent of the human body, involved in the mineralisation of both teeth and bones (Fairley et al 1983, Varughese & Moreno 1981). The fluoride concentration in bones and teeth is about 10,000 times that in body fluids and soft tissues (Bergmann & Bergmann 1991, 1995). Nearly 99% of the body's fluoride is bound strongly to calcified tissues. Fluoride in bone appears to exist in both rapidly- and slowly-exchangeable pools. Because of its role in the prevention of dental caries, fluoride has been classified as essential to human health (Bergmann & Bergmann 1991, FNB:IOM 1997)8"*

-----Australian Government  
National Health and Medical Research Council  
<https://www.nrv.gov.au/nutrients/fluoride>

**8. Letter: "The enamel of teeth that have been exposed to fluorine are actually more resistant to acid attack, but more prone to crumble under high friction loads."**

Facts:

A. Teeth are not exposed to fluorine, in regard to water fluoridation, simply to fluoride ions.

B. There is no valid, peer-reviewed scientific evidence that teeth are "more prone to crumble" under any loads, "friction" or otherwise, as a result of exposure to optimally fluoridated water.

**9. Letter: "Mild dental fluorosis is said to be a "cosmetic dental problem", without noting that dental fluorosis is also one of the prime diagnostic signs of chronic fluorine intoxication".**

Facts:

A. Fluorine is not ingested as a result of water fluoridation. Therefore there can be no "fluorine intoxication" associated with this public health initiative.

B. There is no valid, peer-reviewed scientific evidence that the mild dental fluorosis which may be associated with optimally fluoridated water is, in any manner, a "diagnostic sign" of any intoxication from fluoride.

C. The only dental fluorosis considered to be an adverse effect by the 2006 NRC Committee on Fluoride in Drinking Water, is severe. Very mild, mild, and moderate were considered by this committee and most, if not all other knowledge sources, to be nothing more than a cosmetic effect.

**10. Letter: "This paper brings up the ethics of dosing a population without good and proper consent."**

Facts:

A. Water fluoridation is simply the adjustment of the concentration level of a mineral which has existed in water forever. There is no "dosing" of anyone with anything in regard to this public health initiative.

B. There is nothing unethical about the approval by local officials, of the appropriate mineral content in public water supplies under their jurisdiction.

C. There are however, serious ethical considerations in the constant efforts by fluoridation opponents to suddenly deprive entire populations of the benefits of a very valuable public health initiative which has benefited hundreds of millions of individuals over the past 70-plus years, with no proven adverse effects. This is especially true when this deprivation is sought based on nothing but false statements, unsubstantiated claims, misrepresented science, and misinformation.

**11. Letter: "With CWF, the effects are slow to present as pathology, and insidious in the omnipresent nature of the chemical."**

Facts:

Humans have been ingesting fluoride in water since the beginning of time. Hundreds of millions of individuals have ingested fluoridated water over the past 71 years, with no proven adverse

effects. It is unclear as to how long the authors of this letter deem that it takes for these 'insidious' effects to occur.

**12. Letter: "The symptoms of fluorine intoxication are often misdiagnosed."**

Facts:

The authors of this letter provide no documented evidence to support this claim.

**13. Letter: "Grandjean and Landrigan have been studying chemicals....."**

Facts:

A. This is a garbled reference to a March 2014 article in the journal "Lancet" by Grandjean and Landrigan. In this article fluoride was briefly noted as being a neurotoxin. This is not news now, nor was it then. Fluoride has been on the EPA list of neurotoxins for years, along with 150 or so other substances. On that same list are such commonly ingested substances as aspartame (sweetener), ethanol (beer and other alcoholic beverages), salicylate (aspirin), caffeine, and nicotine. In assessing the toxicity of any substance, including plain water, one must consider concentration level. Fluoride at the optimal level at which water is fluoridated is no more neurotoxic than are any of these other substances at their proper use levels.

In an article in "the Atlantic" on March 18, 2014, Dr. Philip Landrigan, co-author of the "Lancet" article with Grandjean, stated:

"Fluoride is very much a two-edged sword," Landrigan said. "There's no question that, at low doses, it's beneficial." Fluoride has been shown to prevent dental cavities and aid skeletal growth. At higher levels, though, it causes tooth and bone lesions. The epidemiologic studies cited by Grandjean and Landrigan, which came from China, imply that high fluoride exposure has negative effects on brain growth."

"Are the exposure levels in China comparable to what we have in our drinking water and toothpaste?" I asked.

"No, they're probably higher," Landrigan said. "In some places in China, there are naturally high levels of fluoride in the groundwater, which picks it up because it's water-soluble."

"So your advice isn't to take it out of our toothpaste?"

"Not at all," Landrigan said. "I think it's very good to have in toothpaste." (8)

**14. Letter: "Those exposed to fluorine show a definite decrease in IQ measurements."**

Facts:

A. This is a garbled reference to the 2011 study by Grandjean and Choi often misrepresented by fluoridation opponents as being the "Harvard Study".

The "Harvard study" was actually a meta-analysis of 27 Chinese studies found in obscure Chinese scientific journals, of the effects of high levels of naturally occurring fluoride in the well water of various Chinese, Mongolian, and Iranian villages. The concentration of fluoride in these studies was as high as 11.5 ppm. By the admission of the reviewers, themselves, these studies had key information missing, used questionable methodologies, and had inadequate controls for confounding factors. These studies were so seriously flawed that the lead researchers, Anna Choi, and Phillippe Grandjean, were led to issue the following statement in September of 2012:

--These results do not allow us to make any judgment regarding possible levels of risk at levels of exposure typical for water fluoridation in the U.S. On the other hand, neither can it be concluded that no risk is present. We therefore recommend further research to clarify what role fluoride exposure levels may play in possible adverse effects on brain development, so that future risk assessments can properly take into regard this possible hazard."

--Anna Choi, research scientist in the Department of Environmental Health at HSPH, lead author, and Phillippe Grandjean, adjunct professor of environmental health at HSPH, senior author

As it seems there have been no translations of these studies into English by any reliable, objective source, it is unclear as to whether they had even been peer-reviewed, a basic for credibility of any scientific study.

B. In a 2014 study published in the prestigious American Journal of Public Health, Broadbent, et al. concluded:

"The findings do not support the assertion that fluoride exposure in the context of CWF can affect neurologic development or IQ. Study members who lived in areas with CWF before age 5 years had slightly higher IQs (on average) in adulthood than those who had not, but this difference was nonsignificant." (9)

**15. Letter: "Malin and Till in England looked at data from the National Survey of Children's Health and the CDC. Parents reported higher rates of medically diagnosed ADHD in their children in states in which a greater proportion of people receive fluoridated water from public water supplies".**

Facts:

A. Malin's study has been widely criticized and discredited in the scientific literature, for its poor methodology, inadequate control for variables, and reaching conclusions not supported by the peer-reviewed science.

"It's an ecological study design with 51 observations (50 states & DC), and is not appropriate to test a hypothesis. ADHD prevalence was based on self-reported data, and hence had a potential of misclassification of disorder status. Statewide fluoridation measures were used. Individuals' exposure to fluoridation were not measured. Due to ecological assessment of exposure to fluoride in drinking water and the use of prevalence data of self-reported ADHD and water fluoridation from different years, the findings are at high risk for ecological fallacy. Authors did not adjust for important confounders (smoking, low birth weight, age, sex etc.). Moreover, authors' poor literature review and skewed interpretation of literature concerning fluoride and neurodevelopmental defects may have introduced bias." (10)



B. Malin's study was published in an open access, online journal, "Environmental Health", whose co-editor-in chief is Phillippe Grandjean. One of the primary reviewers of Malin's study was Anna Choi, Grandjean's co-author of the review of the Chinese "IQ" studies.

In a 2014 study, published in the Journal of Attention Disorders, using the same data as did Malin, Huber, et al. found:

**"RESULTS:**

Both the datasets independently revealed that the prevalence of ADHD decreases with increasing altitude ( $R^2 = .38, p < .001$ ;  $R^2 = .31, p < .001$ ), respectively. This study controlled for potential confounds (e.g., low birth weight, ethnicity, and household size)."

**"CONCLUSION:**

These findings suggest a need for further investigation into the extent by which altitude may serve as a protective factor for ADHD." (11)

That the same data could be used to reach an entirely different conclusion, is clear demonstration of the poor control for variables, such as altitude, in Malin's study.

**16. Letter: "Trendley Dean, the man most people hold responsible for CWF, did a study in 1942. However Dr. Dean had no knowledge of the cause of tooth decay."**

Facts:

Trendley Dean was the first Director of the US National Institute of Dental Research. To claim that he had no knowledge of the cause of tooth decay is like stating that Albert Einstein had no knowledge of the relationship between energy and mass. Acidic assault of bacterial acid on tooth enamel had been known and extensively studied since late in the 19th century.

**17. Letter: "Dean pointed out that if the level of fluorine in water is too high, fluorosis can be so severe that the enamel will chip immediately off immediately following eruption from the gums."**

Facts:

While severe dental fluorosis can cause brown discoloration and pitting of the teeth, it is doubtful that Dean ever stated that enamel would "chip off immediately following eruption." This is a moot point, anyway, given that severe dental fluorosis does not occur attributable to optimal levels of fluoride in water. Dean had been alerted to the brown stains of teeth associated with increased resistance to dental decay in areas with high fluoride content in the groundwater, by Dr. Frederick McKay, who was the first researcher to tie together the brown stains, increased decay resistance and high fluoride levels in water. Dean spent a good portion of his career in researching to find at what level of fluoride in water would provide this increased decay, while not causing the discoloration. His work is largely responsible for the establishment of the optimal level of fluoride by the U.S. Public Health Service in 1962. The current level is 0.7 parts per million.

**18. Letter: "In the 21st century, a review has shown the need to reduce the EPA maximum level allowed, which stands at 4.0 mg/liter to prevent increasing the risk of severe dental fluorosis and to prevent increased risk of bone fracture."**

Facts:

This in reference to the report of the 2006 NRC Committee on Fluoride in Drinking Water. This Committee was charged to evaluate the adequacy of the EPA primary and secondary MCLs for fluoride, 4.0 ppm and 2.0 ppm respectively, to protect against adverse effects. The final recommendation of this Committee was for the primary MCL to be lowered from 4.0 ppm. The sole reasons cited by the Committee for this recommendation were the risk of severe dental fluorosis, bone fracture, and skeletal fluorosis, with chronic ingestion of water with a fluoride content of 4.0 ppm or greater. Nothing else. Had this Committee deemed there to be any other concerns with fluoride at this level, it would have been responsible for stating so and recommending accordingly. It did not.

Additionally, the NRC Committee made no recommendation to lower the secondary MCL of 2.0 ppm. Water is fluoridated at 0.7 ppm, one third the level which the 2006 NRC Committee on Fluoride in Drinking Water made no recommendation to lower.

Given that skeletal fluorosis is so rare in the US as to be non-existent, the only concerns remaining with fluoride at level of 4.0 mg/liter are severe dental fluorosis and bone decay. The Committee made no recommendation to lower the EPA secondary MCL from 2.0 mg/liter. **(3)**

In March of 2013, Dr. John Doull, Chair of the 2006 NRC Committee on Fluoride in Drinking Water made the following statement:

*"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"*

**19. Letter: "Kurttio, Gustavsson, Vartianen, and Pekkanen in Finland found that the research suggest that fluoride increases the risk of hip fractures only among older women. Most of the water in the areas studied is contaminated with natural calcium fluoride from geological sources through wells.....The results show that women aged 50-64 years at the beginning of the follow up with estimated high fluoride exposure had statistically significant increased hip fracture risk"**

Facts:

A. Calcium fluoride does not exist in groundwater. "Naturally occurring" fluoride in water is fluoride ions, not the compound calcium fluoride.

B. The "older women" had "high fluoride exposure". This is of no relevance to CWF. Water is fluoridated at the minuscule level of 0.7 mg/liter.

**20. Letter: "The EPA produces what are known as 'Re-Registration Eligibility Decision' documents for the use of chemicals in industry. The end use of sodium fluoride in this RED is for anti-fungal/anti-rot treatment for wood. In the RED for sodium fluoride, in 2007, the following is found: 'sodium fluoride must not be used to treat wood intended**

**for the construction or maintenance of beehives'. In other words, don't make a beehive, but it's OK to drink it and spray it on your lawn."**

Facts:

The "RED" is in regard to NaF concentrations suitable for antimicrobial wood treatment. These concentrations are 1% and greater. 1% is equal to 10,000 parts per million. Water is fluoridated at 0.7 parts per million.

Properties of sodium fluoride at levels improper for human consumption are irrelevant to optimally fluoridated water. Concentration level is the difference between safety and toxicity of every substance known to man, including plain water.

**21. Letter: "In light of new information and a growing body of evidence, it is clear that community water fluoridation is a waste of time and money with no discernible benefit that can't be accounted for by other factors. This practice is not beneficial and may be exceedingly harmful to the citizens who have to drink it. No research has been found showing the benefits of fluoridation in which researchers ever controlled for simple things, such as personal oral hygiene."**

Facts:

A. There is no "new information and growing body of evidence" in regard to purported "harm" from optimally fluoridated water. There are only the same arguments as have been attempted by fluoridation opponents for the past 71 years. They are simply repackaged and recycled for each new generation of activists. That these arguments appear to be "new information" to each new generation does not mean that they are, or that they haven't been long since, known, considered, and properly addressed by responsible healthcare entities.

B. Countless peer-reviewed scientific studies clearly demonstrate the effectiveness of water fluoridation in the prevention of dental decay in entire populations. A list of some of the most recent ones may be found at the end of this report.

C. There is no valid, peer-reviewed scientific evidence that optimal level fluoride is in any manner "exceedingly harmful" to anyone.

D. Peer-reviewed fluoridation studies, as a matter of routine, control for standard variables. This certainly includes "simple things, such as personal oral hygiene."

**The following pages consist of:**

1. Cost saving studies of fluoridation
2. Effectiveness studies of fluoridation
3. References

**Cost Savings of Water Fluoridation:**

**1. Nationally:** For most cities, every \$1 invested in water fluoridation saves \$38 in dental treatment costs.

“Cost Savings of Community Water Fluoridation,”  
U.S. Centers for Disease Control and  
Prevention, accessed on March 14, 2011 at  
[http://www.cdc.gov/fluoridation/fact\\_sheets/cost.htm](http://www.cdc.gov/fluoridation/fact_sheets/cost.htm).

**2. Texas:** A Texas study confirmed that the state saved \$24 per child, per year in Medicaid expenditures for children because of the cavities that were prevented by drinking fluoridated water.

“Water Fluoridation Costs in Texas: Texas Health Steps (EPSDT-Medicaid),  
Department of Oral Health Website (2000),  
[www.dshs.state.tx.us/dental/pdf/fluoridation.pdf](http://www.dshs.state.tx.us/dental/pdf/fluoridation.pdf),

**3. New York:** A 2010 study in New York State found that Medicaid enrollees in less fluoridated counties needed 33 percent more fillings, root canals, and extractions than those in counties where fluoridated water was much more prevalent. As a result, the treatment costs per Medicaid recipient were \$23.65 higher for those living in less fluoridated counties.

Kumar J.V., Adekugbe O., Melnik T.A., “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.

The original figure (\$23.63) was corrected in a subsequent edition of this journal and clarified to be \$23.65. See: “Letters to the Editor,”  
Public Health Reports (November-December 2010), Vol. 125, 788.

**4. Colorado:** 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.

-----O’Connell J.M. et al., “Costs and savings associated with community water fluoridation programs in Colorado,”  
Preventing Chronic Disease (November 2005), accessed on  
March 12, 2011 at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1459459/>.

**5. Louisiana:** A 1999 study compared Louisiana parishes (counties) that were fluoridated with those that were not. The study found that low-income children in communities without fluoridated water were three times more likely than those in communities with fluoridated water to need dental treatment in a hospital operating room.

-----“Water Fluoridation and Costs of Medicaid Treatment for Dental Decay – Louisiana, 1995-1996,”  
Morbidity and Mortality Weekly Report, (U.S. Centers for Disease Control and Prevention), September 3, 1999, accessed on March 11, 2011 at  
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4834a2.htm>.

6. By reducing the incidence of decay, fluoridation makes it less likely that toothaches or other serious dental problems will drive people to hospital emergency rooms (ERs)—where treatment costs are high. A 2010 survey of hospitals in Washington State found that dental disorders were the leading reason why uninsured patients visited ERs.

-----Washington State Hospital Association, Emergency Room Use (October 2010) 8-12,  
<http://www.wsha.org/files/127/ERreport.pdf>, accessed February 8, 2011.

7. Scientists who testified before Congress in 1995 estimated that national savings from water fluoridation totaled \$3.84 billion each

-----Michael W. Easley, DDS, MP, “Perspectives on the Science Supporting Florida’s Public Health Policy for Community Water Fluoridation,”  
Florida Journal of Environmental Health, Vol. 191, Dec. 2005, accessed on March 16, 2011 at  
<http://www.doh.state.fl.us/family/dental/perspectives.pdf>.

### **Effectiveness of Community Water Fluoridation:**

1) 2015

#### **Results**

In the 3 areas the proportion of children who received a dental examination varied; 77.5% (n = 825) for the fluoridated area, 80.1% (n = 781) for the pre-fluoridated area and 55.3% (n = 523) for the non-fluoridated area. The mean dmft was 1.40 for the fluoridated area, 2.02 for the pre-fluoridated area and 2.09 for the non-fluoridated area. These differences were statistically significant (p < 0.01). Differences were also noted in the proportion of children who were caries free, 62.6% fluoridated area, 50.8% for the pre-fluoride area and 48.6% for the non-fluoride location.

#### **Conclusion:**

The children living in the well-established fluoridated area had less dental caries and a higher proportion free from disease when compared with the other two areas which were not fluoridated. Fluoridation demonstrated a clear benefit in terms of better oral health for young children.

---The Dental Health of primary school children living in fluoridated, pre-fluoridated and non-fluoridated communities in New South Wales, Australia  
Anthony S Blinkhorn, Roy Byun, George Johnson, Pathik Metha, Meredith Kay, and Peter Lewis

## 2) RESULTS:

The prevalence of dental caries was inversely related and the prevalence of fluorosis was directly related to the concentration of fluoride in the drinking water. The mean DMFS in the communities with 0.8 to 1.4 ppm fluoride was 53.9 percent to 62.4 percent lower than that in communities with negligible amounts of fluoride. Multivariate analysis showed that water fluoride level was the strongest factor influencing DMFS scores. The prevalence of fluorosis ranged from 1.7 percent to 15.4 percent, and the increase in fluorosis with increasing fluoride exposure was limited entirely to the milder forms.

----J Public Health Dent. 2000 Summer;60(3):147-53.

The prevalence of dental caries and fluorosis in Japanese communities with up to 1.4 ppm of naturally occurring fluoride.

Tsutsui A, Yagi M, Horowitz AM.

Source

Department of Preventive Dentistry, Fukuoka Dental College, Fukuoka, Japan. [tutuia@college.fdcnet.ac.jp](mailto:tutuia@college.fdcnet.ac.jp)

<http://www.ncbi.nlm.nih.gov/pubmed/11109211>

## 3) 2000

### CONCLUSIONS:

Caries levels are lower among children with fluoridated domestic water supplies. Decay levels are much lower in 2002 than they were in 1984 and in the 1960s. The oral health of the less well-off is worse than that of the rest of the population. The prevalence of dental fluorosis is higher amongst children and adolescents with fluoridated water supplies. Comparisons with 1984 data show an increase in the prevalence of fluorosis since that time.

----Community Dent Health. 2004 Mar;21(1):37-44.

Dental caries and enamel fluorosis among the fluoridated and non-fluoridated populations in the Republic of Ireland in 2002.

Whelton H, Crowley E, O'Mullane D, Donaldson M, Kelleher V, Cronin M.

Source

Oral Health Services Research Centre, University Dental School and Hospital, Wilton, Cork, Ireland.

4) <http://www.ncbi.nlm.nih.gov/pubmed/7643331>

### CONCLUSIONS:

The ingestion of water containing 1 ppm or less fluoride during the time of tooth development may result in dental fluorosis, albeit in its milder forms. However, in these times of numerous products containing fluoride being available, children ingesting water containing 1 ppm fluoride continue to derive caries protection compared to children ingesting water with negligible amounts of fluoride. Thus, the potential for developing a relatively minor unesthetic condition must be weighed against the potential for reducing dental disease.

-----J Public Health Dent. 1995 Spring;55(2):79-84.

Dental fluorosis and caries prevalence in children residing in communities with different levels of fluoride in the water.

Jackson RD, Kelly SA, Katz BP, Hull JR, Stookey GK.

Source

Oral Health Research Institute, Indianapolis, IN 46202-2876, USA.

<http://www.ncbi.nlm.nih.gov/pubmed/15074871>

5) 2004

#### CONCLUSIONS:

The results of this study support existing work suggesting water fluoridation together with the use of fluoridated dentifrice provides improved caries prevention over the use of fluoridated dentifrice alone. The social gradient between caries and deprivation appears to be lower in the fluoridated population compared to the non-fluoridated population, particularly when considering caries into dentine, demonstrating a reduction in inequalities of oral health for the most deprived individuals in the population.

----The association between social deprivation and the prevalence and severity of dental caries and fluorosis in populations with and without water fluoridation

Michael G McGrady, Roger P Ellwood, [...], and Iain A Pretty

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543717/>

6) 2012

#### CONCLUSIONS:

Fewer studies have been published recently. More of these have investigated effect at the multi-community, state or even national level. The dmf/DMF index remains the most widely used measure of effect. % CR were lower in recent studies, and the 'halo' effect was discussed frequently. Nevertheless, reductions were still substantial. Statistical control for confounding factors is now routine, although the effect on per cent reductions tended to be small. Further thought is needed about the purpose of evaluation and whether measures of effect and study design are appropriate for that purpose.

----Community Dent Oral Epidemiol. 2012 Oct;40 Suppl 2:55-64. doi: 10.1111/j.1600-0528.2012.00721.x.

Effectiveness of water fluoridation in caries prevention.

Rugg-Gunn AJ, Do L.

Newcastle University, UK. [andrew@rugg-gunn.net](mailto:andrew@rugg-gunn.net)

<http://www.ncbi.nlm.nih.gov/pubmed/22998306>

7) 2012

#### CONCLUSIONS:

Data showed a significant decrease in dental caries across the entire country, with an average reduction of 25% occurring every 5 years. General trends indicated that a reduction in DMFT index values occurred over time, that a further reduction in DMFT index values occurred when a

municipality fluoridated its water supply, and mean DMFT index values were lower in larger than in smaller municipalities.

----Int Dent J. 2012 Dec;62(6):308-14. doi: 10.1111/j.1875-595x.2012.00124.x.

Decline in dental caries among 12-year-old children in Brazil, 1980-2005.

Lauris JR, da Silva Bastos R, de Magalhaes Bastos JR.

Department of Paediatric Dentistry, University of São Paulo, Bauru, São Paulo, Brazil. jrlauris

<http://www.ncbi.nlm.nih.gov/pubmed/23252588>

8). 2012

Abstract

The effectiveness of fluoridation has been documented by observational and interventional studies for over 50 years. Data are available from 113 studies in 23 countries. The modal reduction in DMFT values for primary teeth was 40-49% and 50-59% for permanent teeth. The pattern of caries now occurring in fluoride and low-fluoride areas in 15- to 16-year-old children illustrates the impact of water fluoridation on first and second molars.

----Caries Res. 1993;27 Suppl 1:2-8.

Efficacy of preventive agents for dental caries. Systemic fluorides: water fluoridation.

Murray JJ.

Department of Child Dental Health, Dental School, University of Newcastle upon Tyne, UK.

<http://www.ncbi.nlm.nih.gov/pubmed/8500120>

9) 1993

CONCLUSIONS:

The survey provides further evidence of the effectiveness in reducing dental caries experience up to 16 years of age. The extra intricacies involved in using the Percentage Lifetime Exposure method did not provide much more information when compared to the simpler Estimated Fluoridation Status method.

-----Community Dent Health. 2012 Dec;29(4):293-6.

Caries status in 16 year-olds with varying exposure to water fluoridation in Ireland.

Mullen J, McGaffin J, Farvardin N, Brightman S, Haire C, Freeman R.

Health Service Executive, Sligo, Republic of Ireland.

<http://www.ncbi.nlm.nih.gov/pubmed/23488212>

10). 2012

CONCLUSIONS:

Children with severe dental caries had statistically significantly lower numbers of lesions if they lived in a fluoridated area. The lower treatment need in such high-risk children has important implications for publicly-funded dental care.

-----Community Dent Health. 2013 Mar;30(1):15-8.

Fluoridation and dental caries severity in young children treated under general anaesthesia: an analysis of treatment records in a 10-year case series.

Kamel MS, Thomson WM, Drummond BK.



Department of Oral Sciences, Sir John Walsh Research Institute, School of Dentistry, The University of Otago, Dunedin, New Zealand.

Research Design: Consecutive clinical case series: clinical details (diagnoses and the treatments provided) were recorded for children who had received comprehensive dental care under GA between 2000 and 2009. Age, gender, ethnicity, socio-economic status and fluoridation status (determined from the residential address) were also recorded.

<http://www.ncbi.nlm.nih.gov/pubmed/23550501>

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Food and Nutrition Board, Institute of Medicine, National Academies  
<http://iom.edu/Activities/Nutrition/SummaryDRIs/~media/Files/Activity%20Files/Nutrition/DRIs/ULs%20for%20Vitamins%20and%20Elements.pdf>
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Jonathan M. Broadbent, PhD, W. Murray Thomson, BSc, PhD, Sandhya Ramrakha, PhD,  
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Huber RS1, Kim TS2, Kim N3, Kuykendall MD4, Sherwood SN5, Renshaw PF6, Kondo DG6.  
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