



Response to Paper of Anat Gesser-Edelsburg and Yaffa Shir-Raz

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October 7, 2016

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This paper is an apparent attempt by fluoridation opponents in Israel to present claims against fluoridation under the guise of being an "objective" essay on communication. While the authors claim that the paper "is not intended to decide for or against [fluoridation]" they proceed to provide completely one-sided, biased information against the initiative, purporting to be "objectively" presenting "what can the Israeli case of water fluoridation teach us". The anti fluoridation information in this paper is not new, has not been kept from the public as implied in the paper, and has been long-since fully considered and addressed by public health and health policy personnel who have overseen the initiative of water fluoridation. The following is a point-by-point discussion of the fallacies of the arguments utilized by these authors in their attempt to discredit the decision of Israeli health officials to resume fluoridation in that country.

Responses

1. Paper: *"However, some studies, including recent ones, have found no difference in the level of dental caries between children who drink fluoridated water, compared to those who drink non-fluoridated water, and some have found evidence for various adverse impacts on health. Examples include Warren et al. (2009), Choi et al. (2012), Grandjean and Landrigan (2014) and Peckham, Lowery, and Spencer (2015)."*

A. Warren et al. demonstrated the difficulty that exists today in segregating fluoridated groups from non-fluoridated groups sufficiently enough to make credible assessments of an optimal fluoride intake. It did not demonstrate that water fluoridation is ineffective, nor did it identify any adverse effects associated with optimally fluoridated water.

"Today, evidence suggests that, although there appear to be some benefits from systemic/ ingested F (16,17), the benefits of fluoride are mostly topical. Therefore, with widespread water fluoridation and countless fluoride-containing products available, quantifying the intakes of fluoride is much more complex than it was several decades ago."

The dental fluorosis discussed by Warren is not only considered not to be an adverse effect, it is often not even considered to be undesirable.

"It should be emphasized that while almost all of the fluorosis cases in the present study were mild, the level of esthetic concern among individual cases likely also varied considerably so that, as demonstrated in a previous study, an "optimal" fluoride level to avoid fluorosis may differ depending on the threshold used to define fluorosis. This is important because as reported in a recent article, mild fluorosis was associated with higher quality of life measures, which suggests that avoiding all fluorosis may not be warranted." (1)

B. Choi, et al. was a 2011 meta-analysis of 27 Chinese studies dug out of obscure Chinese journals by researchers Phillippe Grandjean and Anna Choi. These studies were of the effects of high levels of fluoride (as high as 11.5 ppm) in the well-water of various Chinese, Mongolian, and Iranian villages.

By the admission of Grandjean and Choi, themselves, these studies had key information missing, inadequate control for confounders, and questionable methodologies. These 27 studies were so seriously flawed that Grandjean and Choi were led to issue a public statement in March, 2012 that the studies should not be used to judge water fluoridation in the US. This obviously has not stopped antifluoridationists from doing so anyway.

"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 Philippe Grandjean, adjunct professor of environmental health at HSPH, senior author (2)

C. Grandjean and Landrigan is in reference to a 2014 article in the journal "Lancet". The authors of this article make very little mention of fluoride, and when they do, they do not differentiate concentration levels, just stating that fluoride is a neurotoxin. On this same list of neurotoxins are aspartame (sweetener), ethanol (beer and other alcoholic drinks), salicylate (aspirin), caffeine, and nicotine. (3)

D. Peckham, Lowery, and Spencer has received widespread criticism in the scientific literature for its poor methodology, inadequate control for confounders, and reaching a conclusion not supported by the scientific literature.

From Warren and Saraiva:

"In summary, this study [Peckham]is an ecologic one that has several significant flaws, making it almost meaningless with regard to assessing any possible association between water fluoridation and hypothyroidism. As such, this study provides no evidence of a causal relationship between water fluoride concentration and hypothyroidism." (4)

From Grimes:

"A major weakness of this study [Peckham] is the fact that other potential confounding factors have not been taken into account; this makes the conclusions regarding the community health utility of water fluoridation problematic. The strong conclusion of the paper by Peckham et al is not supported by the published literature." (5)

From Peel:

"The quality of the evidence [Peckham] is moderate with important methodological limitations, and should be interpreted with caution."

- There is a high risk of conflict of interest as the principal investigator is a long-time anti-fluoridation activist.

. The authors' assessment of the evidence-base is unbalanced and misinterpreted, contains inaccuracies and lacks citation of key studies.

- The results of this study do not support the consistent findings of three scientific reviews, which report insufficient evidence of an association between exposure to fluoride in drinking water and adverse thyroid effects." (6)

2. "In an effort to reach science-based recommendations, three major expert committees have systematically reviewed the evidence on the safety and efficacy of water fluoridation over the past 15 years – The York Committee (McDonagh et al. 2000); NRC (Committee on Fluoride in Drinking Water 2006); and Scientific Committee on Health and Environmental Risks (SCHER) (2011). Yet, all three expert committees have found that much of the evidence produced by studies – both for and against fluoridation – is of poor quality, and the bottom line emerging from all three is that there is uncertainty surrounding both the safety and the efficacy of fluoridation

A. York 2000, set narrow inclusion criteria for studies it chose to review. It found 214 studies which met its criteria. This immediately excluded from the review, thousands of relevant, peer-reviewed fluoride studies published in respected scientific journals.

Within these 214 studies, York did not find that "much of the evidence is of poor quality". It found varying levels of quality. Additionally, York utilized as its "gold standard" for comparison of quality, randomized controlled trials (RCT). As the 2015 update to York 2000, the Cochrane Review, noted in its report, RCTs are not feasible for large, population based public health initiatives, such as water fluoridation, and will therefore never be done for this initiative. Cochrane noted the unfairness of the GRADE system of comparison of fluoridation studies, in view of the infeasibility of RCTs, and the need to consider all pertinent factors when assessing water fluoridation.

York found:

"A total of 26 studies of the effect of water fluoridation on dental caries were found. For this objective, the quality of studies found was moderate (no level A studies)."

"No level A or B studies examining the effect of water fluoridation on the inequalities of dental health between social classes were identified"

"Dental fluorosis was the most widely and frequently studied of all negative effects. The fluorosis studies were largely cross-sectional designs, with only four before-after designs. Although 88 studies of fluorosis were included, they were of low quality. The mean validity score for fluorosis was only 2.8 out of 8. All, but one, of the studies were of evidence level C. Observer bias may be of particular importance in studies assessing fluorosis. Efforts to control for the effects of potential confounding factors, or reducing potential observer bias were uncommon."

"There were 29 studies included on the association between bone fracture and bone development problems and water fluoridation. Other than fluorosis, bone effects (not including bone cancers) were the most studied potential adverse effect. These studies had a mean validity score of 3.4 out of 8. All but one study were of evidence level C."

"There were 26 studies of the association of water fluoridation and cancer included. Eighteen of these studies are from the lowest level of evidence (level C) with the highest risk of bias" (7)

From Cochrane 2015:

"However, there has been much debate around the appropriateness of GRADE when applied to public health interventions, particularly for research questions where evidence from randomised controlled trials is never going to be available due to the unfeasibility of conducting such trials. Community water fluoridation is one such area." (8)

B. 2006 NRC Committee on Fluoride in Drinking Water.

The report makes it clear that there is sufficient relevant data to consider only three clinical end points at 4 mg/L - severe enamel fluorosis, skeletal fluorosis and bone fractures - to determine the safety. All other clinical end points do not raise to the level of concern. (9)

In March of 2013, Dr. John Doull, Chair of that 2006 NRC committee 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"

---John Doull, MD, PhD, Chair of the National Academy of Sciences, National Research Council 2006 Committee Report on Fluoride in Drinking Water (10)

C. SCHER

"The cariostatic effect of topical fluoride application, e.g. fluoridated toothpaste, is to maintain a continuous level of fluoride in the oral cavity. Scientific evidence for the protective effect of

topical fluoride application is strong, while the respective data for systemic application via drinking water are less convincing. No obvious advantage appears in favour of water fluoridation as compared with topical application of fluoride. However, an advantage in favour of water fluoridation is that caries prevention may reach disadvantaged children from the lower socioeconomic groups."

SCHER concludes:

Hydrolysis of hexafluorosilicates, used for drinking water fluoridation, to fluoride was rapid and the release of fluoride ion was essentially complete. Therefore, the fluoride ion is considered the only relevant substance with respect to this opinion.

There is a risk for dental fluorosis in children with systemic fluoride exposure, and a threshold cannot be detected.

The occurrence of endemic skeletal fluorosis has not been reported in the EU general population.

There is not sufficient evidence linking fluoride in the drinking water to the development of osteosarcoma.

Fluoride intake from drinking water at the level occurring in the EU does not appear to hamper children's neurodevelopment and IQ levels.

Human studies do not suggest adverse thyroid effects at realistic human exposures to fluoride.

There is no new evidence from human studies indicating that fluoride in drinking water influences male and female reproductive capacity.

The upper tolerable intake level (UL) is not exceeded for adults and children between 12 and 15 years living in areas with fluoridated drinking water where the concentration of fluoride does not exceed 0.8 mg/L.

The UL was exceeded in children between 6 and 12 years living in areas with fluoridated drinking water (with levels above 0.8 mg/L) when consuming more than 1 L water/day and using adult toothpaste containing 0.15% fluoride.

The UL is exceeded in children between 1 and 6 years of age living in areas with fluoridated drinking water (at fluoride concentration levels above 0.8 mg/L) when consuming more than 0.5 L water and using adult toothpaste containing 0.15% fluoride.

For infants, when the fluoride concentration in drinking water is above 0.8 mg/L, the exposure to fluoride is estimated to exceed 0.1 mg/kg/day.

Water fluoridation as well as topical fluoride applications, e.g. fluoridated toothpaste or varnish, appears to prevent caries, primarily on permanent dentition, but topical application is the more efficient measure.

In children, a very narrow margin exists between achieving the beneficial effects of fluoride in caries prevention and the adverse effects of dental fluorosis.

Exposure of environmental organisms to the levels of fluoride used for fluoridation of drinking water is not expected to lead to unacceptable risks to the environment. (11)

The effects of fluoridation have been clearly demonstrated to be both topical and systemic. Given that SCHER states that "scientific evidence for the protective effect of topical fluoride application is strong," it cannot be credibly stated that SCHER concluded that the fluoride evidence "is of poor quality, and the bottom line emerging from all three is that there is uncertainty surrounding both the safety and the efficacy of fluoridation". (12) (13) (14)

3. Paper: "A similar conclusion also emerged from the most recent review in this field – Cochrane's systematic review of water fluoridation (July 2015). The authors of this review concluded that there is very little updated and high-quality evidence indicating that fluoridation reduces dental caries, while there is significant association between fluoride levels and dental fluorosis (Iheozor-Ejirofor et al. 2015)."

The Cochrane Review was an update of the 2000 York Review. As such, Cochrane set narrow parameters for fluoridation studies it would review, consistent with the parameters originally set by York. It then culled the scientific literature and found 155 studies, out of 4,600 fluoride studies considered, which fit within its parameters. This immediately excluded well over 4,000 quality, peer-reviewed fluoridation studies. Within the 155 studies Cochrane chose to review, it deemed the majority to fall within the parameters it had established for them to be considered at high risk of bias. It did not state that the studies were biased, nor invalid.

The following is what Cochrane found:

"The available data come predominantly from studies conducted prior to 1975, and indicate that water fluoridation is effective at reducing caries levels in both deciduous and permanent dentition in children. Our confidence in the size of the effect estimates is limited by the observational nature of the study designs, the high risk of bias within the studies and, importantly, the applicability of the evidence to current lifestyles. The decision to implement a water fluoridation programme relies upon an understanding of the population's oral health behaviour (e.g. use of fluoride toothpaste), the availability and uptake of other caries prevention strategies, their diet and consumption of tap water and the movement/migration of the population. There is insufficient evidence to determine whether water fluoridation results in a change in disparities in caries levels across SES. We did not identify any evidence, meeting the review's inclusion criteria, to determine the effectiveness of water fluoridation for preventing caries in adults."

Additionally, as noted previously, Cochrane recognized the infeasibility of "gold standard" randomized controlled trials for large population-based public health initiatives, and that they would never be done. As such, Cochrane stated that decisions on such initiatives should be based on all factors involved, not simply the evidence.

Cochrane 2015:

"However, there has been much debate around the appropriateness of GRADE when applied to public health interventions, particularly for research questions where evidence from randomised controlled trials is never going to be available due to the unfeasibility of conducting such trials. Community water fluoridation is one such area."

"We acknowledge that studies on water fluoridation, as for many public health interventions, are complex to undertake and that researchers are often constrained in their study design by practical considerations. For many public health interventions, the GRADE framework will always result in a rating of low or very low quality. Decision makers need to recognise that for some areas of research, the quality of the evidence will never be 'high' and that, as for any intervention, the recommendation for its use depends not just upon the quality of the evidence but also on factors such as acceptability and cost-effectiveness (Burford 2012). In order to overcome some of the concerns around the use of GRADE within this review, a decision was made to omit the GRADE terminology of 'low quality' and discuss the findings in terms of our confidence in the results." (8)

4. Paper: "Despite this uncertainty, dental health policy-makers and health officials continue to communicate it as a safe and effective intervention, and actively promote policies to implement it"

A. There is no "uncertainty" about the safety of water fluoridated at the optimal level. A constant barrage of unsubstantiated claims against the safety of fluoridation has been put forth by fluoridation opponents since the very beginning of the initiative 71 years ago. Given this, water fluoridation has been the most tested public health initiative in history. In spite of this, in the entire 71 year history of water fluoridation, with hundreds of millions having chronically ingested optimally fluoridated water during this time, there have been no proven adverse effects.

Unsubstantiated claims do not constitute "uncertainty".

B. There is no "uncertainty" about the effectiveness of water fluoridation. Countless, quality, peer-reviewed cross-sectional observational studies clearly demonstrate the effectiveness of fluoridation in the prevention of dental decay in entire populations. A list of such studies, dating up to 2015, is included at the end of this document.

5. Paper: "Moreover, despite the uncertainty associated with this decision and in spite of the opposition of various experts, health policy-makers and health officials in Israel opposed German's decision to end mandatory fluoridation and worked relentlessly to prevent it"

The continued claims of "uncertainty" are the editorial opinions of the authors of this paper, which they state as fact, yet, for which they have provided insufficient valid scientific evidence to support.

Yael German's decision was based in large part on misinformation from activist groups such as the New York antifuoridationist faction, "Fluoride Action Network" and "experts" such as Irishman Declan Waugh, whose non peer-reviewed paper on fluoridation was thoroughly refuted and discredited by the Irish Expert Body on Fluorides and Health. The Israeli health policy-makers and health officials "worked relentlessly" and vainly to convince German to cease reliance on

such dubious sources, to heed the legitimate, peer-reviewed science, and recommendations of those most qualified to render appropriate ones.

6. *Paper: "Over the past three decades, levels of caries have fallen significantly worldwide, regardless of the concentration of fluoride in water or the use of fluoridated salt (Cheng, Chalmers, and Sheldon 2007)."*

This statement is based on raw data which controls for none of the myriad variables involved in dental caries. Without proper controls, the data is meaningless in attempting to assess the effectiveness of but one preventive measure such as fluoridation. When appropriate controls are applied, the peer-reviewed scientific evidence demonstrating the effectiveness of fluoridation is overwhelming.

7. *Paper: "Yet, a survey recently commissioned by the Health Ministry Shir-Raz 2015b) found that 62.6% of Israeli 6-year-olds suffer from caries. This rate is similar to that found in a previous survey (59%), conducted in 1989–1990, before the mandatory fluoridation policy was implemented. Therefore, as Sheldon concludes (Shir-Raz 2015a), this finding implies that the mandatory fluoridation policy has not had notable effects."*

No such conclusion can be credibly reached from such raw data, in the absence of controls for any of the myriad variables involved in dental caries.

8. *Paper: "The ongoing controversy over the benefits and risks has led to a policy of discontinuing water fluoridation in many locations throughout the world"*

The reasons why different countries may not fluoridate their water systems are myriad and diverse. The following is an outline of the situation with fluoridation throughout the world taken from a recent issue of the newsletter of the New Zealand National Fluoride Information Service:

Countries with widespread water fluoridation programmes include Australia, the United States of America, Canada, the United Kingdom, Ireland, Spain, Israel, Brazil, Brunei, Chile, Argentina, Colombia, Hong Kong, South Korea, Singapore and Malaysia. Countries with limited water fluoridation programmes include Vietnam, Fiji, Papua New Guinea, and South Korea.

Several countries are unable to introduce water fluoridation programmes due to technical, financial or sociocultural reasons. As an alternative, both salt and milk have been found to be reliable and convenient vehicles for increasing fluoride intake to an optimal level for hard to reach and low socio-economic communities. Studies have found them to be as effective as community water fluoridation schemes.

Some European, Latin American, and Caribbean countries, including France, Switzerland, Germany, Costa Rica, Colombia and Jamaica currently use fluoridated salt schemes. Mexico and most Latin American and Caribbean countries (apart from Argentina, Brazil, Chile and French Guyana) have or have had salt fluoridation programmes.

A smaller number of countries currently have fluoridated milk programmes, including Bulgaria, Chile, China, Peru, Russia, Thailand and the United Kingdom

Some country regions have optimal amounts of naturally occurring fluoride which provides good protection for oral health. examples of countries supplied with naturally fluoridated water at or around the optimum level needed to prevent dental decay include the United Kingdom (estimated 329,000 people), United States of America (estimated 10,078,000 people) Canada (estimated 300,000 people) and Australia (estimated 144,000 people).

It is estimated that 39.5 million people around the world have access to naturally fluoridated water at the optimal level although variations from one community to another over time make it difficult to calculate an accurate total.

Reasons for not fluoridating water supplies and/or using alternative ways of overcoming fluoride deficiencies are simply not restricted to attitudes towards freedom of choice and health concerns, although they may have been deciding factors for a few countries. This is another instance where opponents of fluoridation are making widespread simplistic claims (like Europe bans use of fluorosilicic acid) based on only a few facts, and ignoring (or hiding) the details.

9. Paper: "Currently, only about 5% of the world's population – 350 million people – consumes artificially fluoridated water. In several countries, only a small portion of the population consumes fluoridated water, and in some of them, it is naturally occurring fluoride, and not an artificial additive. For example, in England and in Wales, about 9–10% of water supplies contain 0.5–1 mg/l fluoride, either naturally or as an additive (Cheng, Chalmers, and Sheldon 2007)."

There are two errors in this statement. The first is the implication that there is a difference between "naturally occurring" fluoride, and that fluoride added through fluoridation. There is not. A fluoride ion is a fluoride ion, regardless from what compound it is released. It makes no difference whether that ion is released from calcium fluoride, hydrofluorosilic acid, sodium fluoride, or any other compound.

The second is the implication that the additive used to add fluoride ions during fluoridation, usually hydrofluorosilic acid (HFA), is consumed in fluoridated water. It is not. Upon addition to drinking water, due to the pH of that water (~7) the HFA immediately and completely hydrolyzes (dissociates). The products of this hydrolysis are fluoride ions, identical to those "naturally occurring" fluoride ions, and trace contaminants in barely detectable amounts far below US EPA mandated maximum allowable levels of safety. After this point, the HFA no longer exists in that water. It does not reach the tap. It is therefore not consumed. (15)

10. Paper: In April 2013, shortly after Yael German became health minister, she approved new regulations, formulated in accordance with the recommendations of the Adin Committee, ending mandatory fluoridation in Israel.

The Adin Committee did not recommend that fluoridation be ceased. It recommended that country-wide mandatory fluoridation be halted, with the decision to fluoridate be left to local authorities.

As stated in this paper:

"Yet, after criticism from the public, at the end of 2006, the committee further deliberated, and following a heated debate among the committee members, they voted – in a majority of 6 to 4 – to halt mandatory fluoridation and leave the decision to each local authority"

Yael German mandated country-wide cessation of water fluoridation with no option for local authorities to fluoridate their own water systems.

11. Paper: "Uncertain Risks"

This entire section is predicated on the assumption of validity of the opinion of the authors of this paper that there are "uncertainties" and "uncertain risks" associated with water fluoridation. The authors have presented insufficient evidence to support their opinion in this regard. Therefore the assumption is invalid.

Contradicting this opinion of "uncertainty" are:

A. 71 years of fluoridation, hundred of millions having chronically ingested optimally fluoridated water, with no proven adverse effects.

B. Countless peer-reviewed scientific studies clearly demonstrating the effectiveness of fluoridation.

The Science is Unequivocal

12. Paper: "In addition, a prominent tactic used to create a sense of certainty despite conditions of uncertainty, is withholding information and studies that are inconsistent with the promotion of fluoridation."

The authors yet once again base their statement on their assumption that there is uncertainty about fluoridation, while having presented no credible evidence to support this assumption.

13. Paper: "Thus, instead of explaining that some of the studies support the efficacy and safety of fluoridation while others do not, and presenting this information so that the public can consider it, what is presented is a consolidated and simplified version of this information – a 'ready-made meal' cooked by these policy-makers and health professionals."

The authors are advocating the presentation of all studies to the public, regardless of their validity or relevance to the issue, as if they are equal, and simply two sides to the issue. This would serve not only to confuse the public, but to imply validity to arguments that have no merit.

Fluoridation proponents make claims, then provide valid scientific evidence to support those claims. It is not the responsibility of anyone to present invalid and/or irrelevant information as if it is equal in credibility to that information provided to substantiate claims. Just as is the case with this paper, those with opposing views are free to present them along with whatever evidence they believe supports their views.

When fluoridation opponents have had their their claims rejected by decision makers, after having presented the evidence they believed to support their claims, it is a false assumption that the reason for this rejection was because of inadequate opportunity to present their

evidence, or that there was inadequate attention given to those claims. The first factor that must be considered is the validity and credibility of those claims and the evidence presented to support them.....a factor which fluoridation opponents are rarely willing to acknowledge.

14. Paper: "Moreover, on several occasions, policy-makers and health professionals explicitly deny that such studies exist. For example:"

Dr. Shlomo Sussman, director of Dental Health Division in the Ministry of Health ... said: 'There are no studies that indicate damage to health. The only fact is that fluoride increases resistance to tooth decay.' (The Knesset Labor Welfare and Health Committee 2011)"

Perhaps a more accurate statement by Dr. Sussman would have been that there are no *credible* studies which indicate damage to health.

Yes there are studies which indicate damage to health. However the question is whether these studies are credible or not. The peer-reviewed science and the large reviews of fluoride literature have repeatedly concluded that they are not. So, should these studies be presented to the public as if they are equal in credibility with those that contradict them? Within the space limitations of news articles it is not possible to properly address such studies in order to present to the public an accurate representation as to their invalidity or irrelevance, therefore, the public is left with the erroneous impression that the studies are credible.

The authors seem to be advocating for the *gish-gallop* method of communication which is commonly employed by fluoridation opponents. In this tactic, so much information is put forth in a limited amount of time and/or space that it is impossible to properly address any of it within the limitations of the situation, thereby creating the assumption that the information is credible and valid, whereas under proper scrutiny, it is clearly shown not to be either.

All Experts Agree

15. Paper: Another prominent theme we found is 'All experts agree.' According to this theme, there is a consensus among experts regarding the safety and efficiency of fluoridation, as well as its importance:

This section argues that there is not scientific consensus of the safety and effectiveness of fluoridation. Over 150 of the most highly respected healthcare and healthcare-related organizations in the world recognize the public health benefit of water fluoridation. The initiative is fully supported, by those such as the past 6 Surgeons General of the United States, the Deans of the Harvard Schools of Medicine, Dentistry and Public Health, with confidence in its safety being publicly stated by The Chair of the 2006 NRC Committee on Fluoride in Drinking Water. (16)

There is not one credible organization in the world which opposes fluoridation. Yet, in spite of this clear evidence of scientific consensus of the safety and effectiveness of fluoridation, the authors of this paper argue that a discussion of the Adin Committee should be presented in equal stature?

Summary of the Rest of the Paper

As is the case with the rest of this paper, the final pages are nothing but more of the same presentation of arguments of fluoridation opponents, with the assumption that these arguments are valid, relevant, and warrant equal stature with the information which fully supports fluoridation. The false assumption of "uncertainty" on which the authors have based this entire paper, persists to the end, with a "conclusion and recommendation" presented under the guise of objective analysis of "communication", that admonishes "health officials" to:

- A. Accept the unfounded assumption of uncertainty, as made by the authors of this paper.
- B. "Adhere to scientific information to justify arguments", thereby falsely assuming that this is not what does indeed occur.
- C. "Avoid disparaging comments that resort to unscientific arguments in order to undermine opposing opinions", thereby imposing their biased opinion as to what constitutes "disparaging comments", as if it is fact.

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Effectiveness Studies

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

BMC Oral Health 2015, 15:9 doi:10.1186/1472-6831-15-9<http://www.biomedcentral.com/1472-6831/15/9>

2) 2000

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.

Department of Preventive Dentistry, Fukuoka Dental College, Fukuoka, Japan.

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) 1995

<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.

Source

Newcastle University, UK. 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.

Source

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

jrlauris@fob.usp.br

<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.

Source

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.

Source

Health Service Executive, Sligo, Republic of Ireland. joej.mullen@hse.ie

<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.

Cost- Effectiveness Studies

1. 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.

2. 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,

3. 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. 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. 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>.

Opinions of the Experts

"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

"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"

---John Doull, MD, PhD, Chair of the National Academy of Sciences, National Research Council
2006 Committee Report on Fluoride in Drinking Water

"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, 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, 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, Surgeon General (1998-2002)

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“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, 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, Surgeon General (1982-1989)

The 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.”

The American Academy of Pediatrics

“Fluoride plays a very important role in the prevention of dental [decay]. Although the primary mechanism of action of fluoride in preventing dental [decay] is topical, systemic mechanisms are also important.”

The Centers for Disease Control and Prevention

“For many years, panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective.”

The American Academy of Family Physicians

“Fluoridation of public water supplies is a safe, economical and effective measure to prevent dental [decay].”

The Institute of Medicine

“Evidence continues to reaffirm that community water fluoridation is effective, safe, inexpensive, and is associated with significant cost savings.”

The American Public Health Association

“Much of the credit for the nation’s better oral health can be attributed to the decision in the 1940s to begin adding fluoride to public drinking water systems.”