High Validity Studies on Fluoridation 2011 - 2012

Created on 2013.

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Introduction

This document lists all high validity studies around fluoridation from September 2011 to December 2012. All low to average validity studies are ignored. The papers title, year, abstract, conclusion (if included), key points, strengths and limitations are included. Information about the studies is taken from the NFIS website (www.nfis.org.nz).

This allows for any layman to read up on latest high validity fluoridation studies without needing to search for it and in most cases buy access to do so. This also helps to remove the myth that fluoridation studies are low validity.

Study Validity:

In addition to relevance, each study reviewed was assessed for validity using the criteria listed below:

I. Does the study have a robust design? (For example: is the sample size adequate? Has data been collected in a systematic and uniform manner to minimise bias?)
II. Is data analysed in an appropriate manner? (For example: are the effects of potential confounding factors controlled for?)
III. Are conclusions drawn from the analysis appropriate? (For example: do they acknowledge potential bias in the results and provide an assessment of the effect and direct of any bias?)

List of studies

Title	**The effect on dental enamel of varying concentrations of fluoridated milk with a cariogenic challenge in situ**
Year	2012
Abstract	Objectives: This study investigated the effect of two concentrations of fluoride in milk, 2.5 and 5.0ppm, on the prevention of demineralisation with a cariogenic challenge compared with milk with 0ppm F. Methods: In a controlled, randomised, cross-over, double-blind in situ study, 23 subjects wore a lower removable appliance with 2 enamel slabs for 21 days during each study arm. Subjects used F-free toothpaste and the cariogenic challenge comprised of five 2 min dippings per day in 12% sucrose. The slabs were dipped in 50ml of milk with 0ppm, 2.5ppm or 5.0ppm F twice daily for 5 min. Subjects drank

	100 ml twice per day of the same milk. Slabs were analysed with Knoop micro-hardness to assess changes in mineralisation. Results: Results showed that enamel was softened in all groups but the extent of enamel softness was reduced with an increasing concentration of F in milk, being highly significant for both F groups compared to the control ($p < 0.0001$). 5.0ppm F group showed a trend towards less softening compared to the 2.5ppm F but was not statistically significant.
Conclusion	In our in situ model, 2.5 and 5.0ppm F in milk significantly protected enamel from demineralisation.
Key Points	The study used enamel from human premolar teeth extracted for orthodontic purposes. These were worn inside the oral cavity by volunteers for 2 days prior to the study cycle (to acquire plaque) and then for the 21 days each. The concentrations of fluoridated milk tested (2.5ppm F and 5.0ppm F) were chosen to match current school milk fluoridation programs (2.5ppm) and to investigate whether increasing the fluoride concentration would provide a significantly higher caries preventative benefit (5.0ppm). Both concentrations were well within the safe limits for fluoride ingestion (based on 200ml fluoridated milk being consumed). Both concentrations of fluoridated milk demonstrated (statistically) significantly less reduction in enamel hardness compared to the control (non-fluoridated) milk. The 5.0ppm F milk demonstrated a smaller percentage reduction in enamel hardness compared to the 2.5ppm F milk, however this difference was not statistically significant.
Strengths	Quantitative Study. Enamel was worn in the oral cavity by volunteers, thereby providing 'real world' conditions for the enamel. Other fluoride supplements (toothpaste, mouthwash etc.) were controlled for.
Limitations	The tests were carried out under a strict study protocol, involving consumption of 100ml milk and dipping the enamel in milk periodically throughout the day. School milk programmes using fluoridated milk require compliance of the subject to always drink, and finish, the milk. Concerns about compliance (of both parents and children) were raised in a paper by Forster, Downer and Tickle (BDJ: v210, 2011), which was reviewed previously (October 2011).
Link	http://www.sciencedirect.com/science/article/pii/S030057121200187X

Title	**The association between social deprivation and the prevalence and severity of dental caries and fluorosis in populations with and without water fluoridation**
Year	2012
Abstract	Background: To determine the association between social deprivation and the prevalence of caries (including caries lesions restricted to enamel) and enamel fluorosis in areas that are served by either fluoridated or non-fluoridated drinking water using clinical scoring, remote blinded, photographic scoring for caries and

	fluorosis. The study also aimed to explore the use of remote, blinded methodologies to minimize the effect of examiner bias. Methods: Subjects were male and female lifetime residents aged 11–13 years. Clinical assessments of caries and fluorosis were performed on permanent teeth using ICDAS International Caries Detection and Assessment System) and blind scoring of standardized photographs of maxillary central incisors using TF Index (with cases for fluorosis defined as TF > 0). Results: Data from 1783 subjects were available (910 Newcastle, 873 Manchester). Levels of material deprivation (Index of Multiple Deprivation) were comparable for both populations (Newcastle mean 35.22, range 2.77-78.85; Manchester mean 37.04, range 1.84-84.02). Subjects in the fluoridated population had significantly less caries experience than the non-fluoridated population when assessed by clinical scores or photographic scores across all quintiles of deprivation for white spot lesions: Newcastle mean DMFT 2.94 (clinical); 2.51 (photo), Manchester mean DMFT 4.48 (clinical); 3.44 (photo) and caries into dentine (Newcastle Mean DMFT 0.65 (clinical); 0.58 (photo), Manchester mean DMFT 1.07 (clinical); 0.98 (photo). The only exception being for the least deprived quintile for caries into dentine where there were no significant differences between the cities: Newcastle mean DMFT 0.38 (clinical); 0.36 (photo), Manchester mean DMFT 0.45 (clinical); 0.39 (photo). The odds ratio for white spot caries experience (or worse) in Manchester was 1.9 relative to Newcastle. The odds ratio for caries into dentine in Manchester was 1.8 relative to Newcastle. The odds ratio for developing fluorosis in Newcastle was 3.3 relative to Manchester.
Conclusion	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. However, the risk of developing mostly mild fluorosis is increased in the fluoridated population when associated with the widespread use of fluoridated dentifrice, particularly in the least deprived individuals. The use of ICDAS may provide greater flexibility to report and monitor early carious lesions more favourably than existing methods employed in oral health surveys. The use of intra-oral cameras for blinded caries scoring demonstrated the ability to discriminate between a fluoridated and non-fluoridated population and has good potential for blinded caries assessment but the technique requires additional work to address potential information loss and confounding issues.
Key Points	Study participants required life residency in their area to be included in the study and have maxillary permanent central incisors in place. Postcode details were used to ascribe an individual measure of social deprivation to each participant. Photographic images of teeth used for clinical examination with the examiner blinded to the area of residence of the child.

	The Thylstrup and Fejerskov (TF) index was used to score teeth for dental fluorosis. Demographic, normal hygiene practices and deprivation data were explored to determine if there were significant differences between the fluoridated and non-fluoridated region. The consent rate for dental examination was 64.3% for (fluoridated) Newcastle and 61.7% for (non-fluoridated) Manchester. Of those who consented 79.9% were examined on Newcastle and 82.7% in Manchester. No significant difference was found in non-milk extrinsic sugars (NMES) or dental oral hygiene practices (with the exception of rinsing), between the two areas. DMFT scores for (fluoridated) Newcastle were significantly lower than those for (non-fluoridated Manchester. DMFT increased at each level of deprivation in both Newcastle and Manchester however the gradient was lower in Newcastle compared to Manchester. This difference was significant for each level of deprivation except for the "least deprived". Prevalence of fluorosis was 55% in (fluoridated) Newcastle (48% TF score 1 or 2 7, 1% TF score 3 or more) compared with 27% in (non-fluoridated) Manchester (26% TF score 1 or 2, 1.2% TF score 3 or more). Caries risk (odds ratio) was shown to have statistically significant results for increased age, deprivation and living in a non-fluoridated area. Risk of fluorosis was significantly greater in (fluoridated) Newcastle compared to (non-fluoridated) Manchester, (OR 3.39, 95% CI 2.78-4.15). There was no significant difference in risk of fluorosis and level of deprivation between the two areas apart from amongst those in the lowest category of deprivation.
Strengths	Large sample size (n=1783), and a response rate comparable to other observational studies (63.1%). Comprehensive survey using two examination techniques. Attempts made to control for confounding factors: NMES and dental oral hygiene practices.
Limitations	Two methods of scoring for DMFT were used: clinical and photographic scoring. The photographic scoring was found to be consistently lower than the clinical scoring. It was concluded that this discrepancy would have minimal effect on bias as the difference was consistent between the two localities. Only maxillary incisors were examined for fluorosis in this study as these were the teeth considered large enough to produce clear photographic images from. Fluorosis in other zones was therefore not considered.

	It was not possible to assess previous fluoride intake from the oral hygiene questionnaire (at the time when the teeth examined were most susceptible to developing fluorosis).
Link	http://www.biomedcentral.com/1471-2458/12/1122

Title	**Prevalence and aetiology of juvenile skeletal fluorosis in the south-west of the Hai district, Tanzania – a community-based prevalence and case-control study**
Year	2012
Abstract	Introduction: Fluorosis is endemic throughout the East African Rift valley, including parts of Tanzania. The aim of the study was to identify all cases of deforming juvenile skeletal fluorosis (JSF) in a northern Tanzanian village and to document the extent of dental fluorosis (DF). Methods: Door-to-door prevalence survey of all residents of the village. Residents were assessed for the presence of DF and JSF. Those with JSF and randomly selected controls from the same age range were further assessed for possible JSF risk factors. Results: The village had a population of 1435. DF was endemic within the population, being present in 911 (75.5%; 95% CI, 73.0–77.9) of dentate individuals who were examined (n = 1207). JSF was present in 56 of 1263 people examined, giving a prevalence of 4.4% (95% CI, 3.3–5.6) and was more common in males. Low body mass index, drinking predominantly well water 3 years previously, not being weaned on bananas, the use of fluoride salts in cooking during childhood and drinking more cups of tea per day were independent predictors of JSF.
Conclusion	Within this population exposed to very high-fluoride levels, JSF is a common and preventable public health problem. DF is also an endemic problem. Providing clean, low-fluoride, piped water to affected communities is of obvious health benefit and the ideal solution. However, this is not always realistic. A number of factors were identified as being associated with greater odds of developing JSF. Most of these risk factors are modifiable with small changes in behaviour and diet and may be important to other remote villages with little prospect of a low fluoride piped water supply. Of particular importance is the finding that weaning using bananas may have a preventative role. This is likely to be a cost effective and easily implementable change even in remote communities. Community leaders, politicians and healthcare workers need to be aware of the causes of JSF. Initiatives to educate residents regarding risk factors for JSF and how to avoid them should be encouraged. In areas with a piped water supply, fluoride levels should be monitored regularly.
Key Points	Cases came from Tindigani village, within one of three project areas set up by the Adult Mortality and Morbidity Project (2004) and retained as a disease surveillance site. Controls were also recruited from Tindigani village, and matched to cases by age (between two and thirty years).

	The study populations were identified through a random number generator from the Tanzanian census database. Only lifelong residents were recruited for the study. Dental fluorosis was identified and scored using the Thylstruo and Fejerskov (T-F) Index, Juvenille Skeletal Fluorosis (JSF) was diagnosed using criteria suggested by Krishnamachari (1986). The case control study investigated the following: extent of deformities from JSF, nutritional status, weight, tricep skin fold thickness, fluoride exposure (breast feeding, toothpaste use, tea drinking, magadi (a fluoride salt used in cooking) exposure). Dental fluorosis was endemic in Tindigani, but did not tend to be severe and mainly evident in secondary dentition (only 18.4% of 0-4 year olds had dental fluorosis compared to 90.8% of the remaining population (aged 5-28 years). JSF had a prevalence rate of 4.4%, this was often linked to family groups and age (it was most common in 10-14 year olds). The case control arm of the study: JFS was normally distributed by age with a small tail of older people on the cases, independent predictors of JFS were: lower BMI, bananas not used for weaning, drinking more cups of tea per day, drinking well water in the previous three years, using magadi in cooking in childhood. Of the 275 households surveyed for the study 62.2% were waking 3km to collect low fluoride piped water from a neighbouring village, 22.5% were drinking surface water and 15.3% were drinking well water. This represented a change from 2006 (3 years prior to the study) where only 4.4% drank low fluoride piped water, 42.5% were drinking surface water and 53.1% well water. Fluoride levels were: 9.3-35mgF/l in well water (wells dug 11-19 years ago), 2.1-9.5mgF/L for surface water and 0.2mgF/L for piped water. Dental fluorosis and JSF prevalence in the 4- 30 years age group was linked to the period between wells being dug in the village (1990-1998) and local awareness of problems with drinking from a non-piped water supply (2006).
Strengths	The area under study had been set up as a disease surveillance site, each household each individual had a unique identifying number. Regular census of the population had been taken by trained, experienced enumerators since 1992. All those included in the study were lifelong residents.
Limitations	Much of the data collected relied on recall of previous exposures to risk factors which may have led to recall bias. However the authors point out that the study population was young and were recalling events in the recent past. Also, without specialist knowledge, “many of the risk factors considered will have no apparent association with fluorosis”.
Link	http://onlinelibrary.wiley.com/doi/10.1111/tmi.12027/pdf

Title	Dental Caries and Fluorosis Prevalence and Their Relationship with Socioeconomic and Behavioural Variables among 12 year old School children
Year	2012
Abstract	PURPOSE: To evaluate caries experience and fluorosis prevalence in 12-year-old schoolchildren in Piracicaba, Brazil in 2007 and to verify the relationship of these changes with socioeconomic and behavioural variables. MATERIALS AND METHODS: The sample consisted of 724 schoolchildren from public and private schools. A calibrated dentist performed the examination under natural light using CPI probes and mirrors. The mean number of decayed, missing and filled permanent teeth (DMFT) and the SiC (Significant Caries Index) were determined for dental caries and the Thylstrup and Fejerskov index (T-F) for fluorosis. Socioeconomic and behavioural variables were collected by means of a questionnaire. Multiple logistic regression analyses were performed to verify the relationship of caries and fluorosis with socioeconomic and behavioural variables. RESULTS: The DMFT and SiC indices were 0.85 (±1.54) and 2.52 (±1.72). Fluorosis prevalence was 29.42%. The regression models showed that children whose families earned up to four minimum wages were 2.58 times more prone to having caries than those whose families earned over four minimum wages. Furthermore, children who visited the dentist were 4.27 times more likely to have DMFT > 0. However, for fluorosis, the regression model was not significant.
Conclusion	In conclusion, caries prevalence in 12-year-old school children in Piracicaba was very low; significant associations were observed between the presence of caries and monthly family income, as well as between caries and visiting the dentist. Considering dental fluorosis, the majority of the sample presented no clinical signs of fluorosis. Nevertheless, no tested variable was associated with fluorosis. Therefore, further studies are necessary in order to follow up and compare the data, thereby contributing to the improvement of actions to ensure health.
Key Points	Piracicaba has had a fluoridated water supply since 1971. A sample size of 850 children was calculated as being needed for the study. (This allowed for a 20% non-response rate). Of 850 12 year old children, randomly chosen from 18 public and 6 private schools, a group of 724 (613 from public schools and 111 from private schools) was identified. These children had parental consent for the study and did not have dental hypoplasia, serious systematic disease or fixed braces. This represents a response rate of 85.2%. Mean DMFT for the group as a whole was 0.85, (Standard Deviation 1.54). This is well below the mean of 2.78 for 12 year olds in Brazil. 68 A Significant Caries Index (SiC) was used to examine a subgroup with highest caries prevalence (mean DMFT for the top 1/3 of the study population –see Appendix 6). The SiC index (population=241) had a mean DMFT of 2.52 (Standard Deviation 1.72). This is over twice as high as for the population as a whole but remains below the mean

	DMFT for 12 year olds in Brazil. It is identified in the study that the SiC Index is 'polarised' between fluoridated and non-fluoridated water supplies in Brazil, although no data is given to exemplify this. Statistically significant factors for caries prevalence were: monthly family income less than or equal to four times the minimum wage (2.58 times more likely to have caries, children who had ever visited a dentist (4.27 times more likely to have caries). Visits to the dentist were believed to contribute to an increased mean DMFT due to: 'filled' teeth making up 74% of caries prevalence in the study. It was also hypothesised that 'visit to the dentist' indicated that treatment needs were being met – although this was not supported by other studies in Brazil (involving adolescents). Fluorosis was measured using the Thylstrup and Fejerskov (1978) T-F Index (see Appendix 7) which ranges from 1 – normal translucency of enamel to 9- loss of main part of enamel with change in anatomic appearance of surfaces. 29.42% of children examined showed signs of dental fluorosis. Scores were distributed as follows: 1 (13.95%), 2 (14.78%), 3 (0.69%). Monthly family income and fathers and mothers education were associated with fluorosis however none of these variables were statistically significant in a multiple regression analysis.
Strengths	Comprehensive study, particularly with regard to caries prevalence. Very good response rate which were within the boundaries set by the power calculations. Examiners were calibrated for all parts of the study.
Limitations	The authors acknowledge that "… although data from this study are probably representative of the south-eastern region of Brazil, they do not allow inferences to be drawn with the country as a whole." The link between SiC and water fluoridation was referenced in the discussion but figures were not given. The link between fluorosis and mean DMFT was not investigated.
Link	http://www.quintpub.com/userhome/ohpd/ohpd_2012_01_s0065.pdf

Title	**Fluoride Concentration in Public Water Supply: 72 Months of Analysis**
Year	2012
Abstract	Known as one of the ten most important advances on Public Health in the 20th century, fluoridation of public water supply is a measure of wide population coverage, which is effective on caries control. The city of Araçatuba, in the Northwest region of the São Paulo state, Brazil, started public water supply

	fluoridation in 1972 and, based on the average annual highest temperature, has kept the fluoride concentration between 0.6 to 0.8 mgF/L. The purpose of this study was to analyse monthly the fluoride concentration in public water supply in the city of Araçatuba during 72 months. Water samples were collected monthly on weekdays, directly from the water distribution network, on pre-established locations and analysed in duplicate between November 2004 and October 2010 at the Research Laboratory of the Nucleus for Public Health (NEPESCO) of the Public Health Graduate Program from Araçatuba Dental School/UNESP, Brazil, using a fluoride-specific electrode connected to an ion analyser. From the total of samples (n=591), 67.2% (n=397) presented fluoride concentration between 0.6 and 0.8 mgF/L; 20.6% (n=122) below 0.6 mgF/L; 11.5% (n=68) between 0.8 and 1.2 mgF/L and 0.7% (n=4) above 1.2 mgF/L. Most samples showed fluoride levels within the recommended parameters. Minimal variation was observed among the analysed collection locations, showing that the city has been able to control the fluoride levels in the public water supply and reinforcing the importance of surveillance and constant monitoring to assure the quality of the water delivered to the population.
Key Points	The public water system in Araçatuba is supplied from three sources, two naturally fluoridated and one artificially fluoridated. Three collection sites were identified for each water supply. In all years except 2005 most samples had a water fluoride concentration of 0.55-0.84mgF/l – within range of the desired concentration (0.6-0.8mgF/l). Concentrations ranged from 0-0.44mgF/l to 3.45mgF/l, with only 4 samples above 1.2mgF/l. The study demonstrated the presence of spatial and temporal variations in water fluoride concentration and reinforced the need for constant monitoring of the water supply.
Strengths	Samples were collected and tested in duplicate. Calibration of equipment was performed in triplicate.
Limitations	
Link	http://www.readcube.com/articles/10.1590/S0103-64402012000400024

Title	**Fluoride content of solid foods impacts daily intake**
Year	2012
Abstract	Objective: To determine the amount of fluoride received from solid foods for a cohort of children. Methods: Parents were asked to complete questionnaires for the preceding week and dietary diaries for 3 days for their children. Data collected at 6, 9, 12, 16, 20, 24, 36, 48, and 60 months were analysed as a cross-sectional. Results: At 6 months of age, children ingested an estimated mean of 8 percent of dietary fluoride from solid foods. At 12 months of age, children ingested an

	estimated 39 percent of dietary fluoride from solid foods. Although the percentage of fluoride intake from solid foods stabilized from 24 to 60 months (means of 36-39 percent), some children received as much as 85-88 percent of their dietary fluoride from solid foods.
Conclusion	Some children receive a substantial portion of dietary fluoride from solid foods.
Key Points	The study was a secondary data analysis of the Iowa Fluoride Study (IFS). Individual and filtered water source fluoride concentrations were measured annually and each time a water source changed. Public water supply fluoride concentrations were provided on a monthly basis by the Iowa state health department. Parents also provided children's body weight, allowing fluoride intake per unit body weight over time to be calculated. The number of responses for each food diary ranged from 376-670, there was a reduction in the rate of responses over time due to loss to follow up from the study as a whole. 25 percent of children aged 6 months exceeded the upper limit (UL) for fluoride ingestion, (0.7mg/day – based on average body weight for that age group). 5 percent of children aged 12 months exceeded the UL for fluoride ingestion, (0.9mg/day – based on average body weight for that age group). Less than 5 percent of children aged 24-36 months exceeded the upper limit (UL) for fluoride ingestion, (1.3mg/day – based on average body weight for that age group). Less than 1 percent of children aged 48-60 months exceeded the upper limit (UL) for fluoride ingestion, (2.2mg/day – based on average body weight for that age group). Grains, cereals and starches provided the highest levels of fluoride intake from solid food between the ages of 36 and 60 months. In terms of beverages, at 6-12 months the highest proportion of daily fluoride intake came from infant formula made up with water, after the age of 24 months the highest proportion of daily fluoride intake came from water. The authors state that: "This high level of fluoride ingestion from dietary sources alone places these children at increased risk for developing dental fluorosis." The authors refer to a New Zealand based study by Chowdhury which found lower levels of fluoride ingestion for infants aged 11-13 months living in an area with CWF. It was suggested that the difference between these findings and the current study was due to higher levels of breast feeding in New Zealand, since human milk is very low in fluoride.
Strengths	The study was longitudinal allowing changes over time to be examined.

	The food diaries were kept in real time, increasing likelihood of accuracy by removing the possibility of recall bias. Links could be made between individual food consumption and body weight increasing accuracy of fluoride intake estimates.
Limitations	The study population was predominately white and middle class thereby limiting the extent to which findings can be generalised.
Link	http://www.ncbi.nlm.nih.gov/pubmed/22315974

Title	**Investing in professional advocacy: a case study of a successful fluoridation campaign in rural New South Wales, Australia**
Year	2011
Abstract	In New South Wales (NSW), Australia, the responsibility to implement water fluoridation rests with local government Councils, partly accounting for the hindrance in its state-wide implementation. Since 2003, the NSW Health Department has been actively promoting water fluoridation to the remaining unfluoridated rural communities. OBJECTIVES: To describe the community education and consultation strategies which led to the implementation of fluoridation in two rural NSW towns. METHODS: In February 2005, the Mid-Western Regional Council and the NSW Health Department undertook a comprehensive community education process followed by a consultation process. The education process included the organization of public forums; distribution of fluoridation information packs; building rapport with the local media; and the use of local disease and treatment data to demonstrate oral health disparities with neighbouring fluoridated towns. The consultation process to determine support for fluoridation included seeking written submissions from the community and conducting interviews on a random sample of households by an independent research organization. RESULTS: A total of 502 (N = 1,012) interviews to determine support for fluoridation were completed, achieving a response rate of 49.6%. 54% of respondents wanted their water supplies fluoridated, 25% did not and the remaining 21% were unsure. In June 2005, the Mid-Western Regional Council resolved to implement water fluoridation and fluoride was added to the towns' water supplies in November 2007.
Conclusion	This case study demonstrates that it is possible to garner community support for water fluoridation with the use of a multifaceted approach in educating and consulting communities and stakeholders.
Key Points	Found that if people were informed about water fluoridation, they were more likely to be supportive of the measure. The role of the media as a source of information on water fluoridation cannot be underestimated in any fluoridation campaign. This was confirmed by the survey which reported that the newspaper and radio were the main sources of information from which respondents learnt about fluoridation.

	It is imperative that the community also be consulted about water fluoridation after having been educated about the issue. Campaigns that have sufficiently engaged the local community and all the stakeholders, in this fashion, are less likely to fail. The use of locally relevant evidence to emphasize the disparity of oral health between local children and those living in geographically nearby but fluoridated townships was especially critical during this campaign.
Strengths	Despite the comparatively low response rate of 49.6% (but higher than in many such surveys), there was no significant differences in terms of age specific gender distribution of the sample when compared with that of the adult residents in the towns. Excluded households not supplied by the towns' water and those who did not reside in the towns. Included a power calculation for the sample size.
Limitations	More details on the demographics of the sample would have been helpful.
Link	http://www.ncbi.nlm.nih.gov/pubmed/21916362

Title	**Fluoride consumption and its impact on oral health**
Year	2011
Abstract	OBJECTIVE: The purpose of this study was to evaluate caries and dental fluorosis among Mexican pre-schoolers and school-aged children in a non-endemic zone for fluorosis and to measure its biological indicators. METHODS: DMFT, DMFS, dmft, dmfs, and CDI indexes were applied. Fluoride urinary excretion and fluoride concentrations in home water, table salt, bottled water, bottled drinks, and toothpaste were determined. RESULTS: Schoolchildren presented fluorosis (CDI = 0.96) and dental caries (DMFT = 2.64 and DMFS = 3.97). Pre-schoolers presented dmft = 4.85 and dmfs = 8.80. DMFT and DMFS were lower in children with mild to moderate dental fluorosis (DF). Variable fluoride concentrations were found in the analysed products (home water = 0.18-0.44 ppm F, table salt = 0-485 ppm F, bottled water = 0.18-0.47 ppm F, juices = 0.08-1.42 ppm F, nectars = 0.07-1.30 ppm F, bottled drinks = 0.10-1.70 ppm F, toothpaste = 0-2,053 ppm F). Mean daily fluoride excretion was 422 ± 176 µg/24 h for schoolchildren and 367 ± 150 µg/24 h for pre-schoolers.
Conclusion	Data from our study show that, despite values of excretion within an optimal fluoride intake range, the prevalence of caries was significant in both groups, and 60% of the 11- to 12-year-old children presented with dental fluorosis. In addition, variable fluoride concentrations in products frequently consumed by children were found. Fluoride continues to be the cornerstone of dental caries prevention throughout the world, and there are a variety of sources of fluoride that may contribute to the dietary intake of fluoride. Even though Mexico City is considered a non-endemic area for dental fluorosis according to its low concentration of fluoride in drinking water, the children in our study presented epidemiological indicators of

	overexposure to fluoride. Our data revealed a urinary excretion within the normal limits established and reported by other authors, but epidemiological indexes showed simultaneously high prevalences of caries and dental fluorosis. Because our knowledge is incomplete regarding the amount, duration, and timing of fluoride ingestion that can result in dental fluorosis, however, further research is clearly needed before definitive recommendations can be made regarding the use of fluorides, including the recommended dietary intake of fluoride. Further longitudinal studies are needed to determine the safe fluorine dose for Mexican children, taking in account age, nutritional status, altitude, geographical location and weather, among other factors.
Key Points	Final sample comprised 1942 children; 373 4-5 year olds and 1569 11-12 year olds. Data collected from clinical examination of all participants conducted by two experienced examiners and questionnaires to all parents and multiple urine samples from randomly selected children. Results from analysing the fluoride level in the water supply of 155 homes were higher than data reported in other non-endemic Mexican populations. Mexico City is considered a non-endemic zone for dental fluorosis because of the low concentration of fluoride in drinking water, the children in the study presented with epidemiological indicators of overexposure to fluoride. Urinary excretion was within normal limits, but there were high prevalence of caries and dental fluoride.
Strengths	Data was of high quality.
Limitations	Data on amount, duration, and timing of fluoride ingestion was incomplete – the authors noted 'the wide ranges of fluoride concentrations in bottled water and other beverages make it difficult to assess the actual fluoride intake by the population'.
Link	http://www.mdpi.com/1660-4601/8/1/148/pdf

Title	**Estimating the potential impact on dental caries in children of fluoridating a UK city**
Year	2011
Abstract	OBJECTIVE: To estimate the potential reduction in dental caries among 5-6-year-old children in a city in the South West of England after six years of water fluoridation. METHOD: Thirteen out of 35 inner city wards and seven out of 43 outer city wards (sharing the same water supply) having the highest mean dmft of 5-6-year-olds (recorded in a census survey in 2005/6) and/or highest indexes of multiple deprivation (IMD) were the principal focal point. Population demographic data and 5-6-year-old caries prevalence and experience were examined. Mean IMD scores and aggregated, weighted mean values for dmft and caries prevalence were referred to previously published regression analyses of caries levels plotted against IMD for 34 fluoridated (F) and 233 non-fluoridated (NF) health districts in England in order to estimate potential caries reductions.

	RESULTS: Mean dmft of 5-6-year-olds in the 20 wards with the highest caries levels and/or social deprivation was 2.10 (95% CI 1.87, 2.33) and caries prevalence 49% (95% CI 47%, 52%). In three wards, mean dmft exceeded 2.60. Population of the selected wards was approximately 210,800 with a mean IMD score of 33.70 As a conservative estimate, after six years of fluoridation a caries reduction of > 40% could be expected in 5-6-year-olds for the conurbation overall and for the 20 high caries/high IMD wards, with a gain of 12 percentage points in the absolute proportion caries-free. The overall population of the 78 wards served by the three relevant water treatment works identified was approximately 700,000.
Conclusion	On the basis of current caries levels and population demographics, it appears that a comprehensive fluoridation scheme covering the inner and outer city districts would substantially improve the dental health of the city's children.
Key Points	The study was designed as a worked example of the use of the predictive tool described by Foster et al. (2009) to provide a pragmatic indication, for planning purposes, of the expected improvements in dental health from fluoridating the water supplies of the city and its environs. The study was not intended to prove that fluoridation is effective. On the basis of current caries levels and population demographics, it appeared that a comprehensive fluoridation scheme covering the inner and outer city districts would substantially improve the dental health of the children of a city in South-West England.
Strengths	Provided a worked example of the tool developed previously to indicate expected improvements in dental health from water fluoridation. In the previous census survey between 75-80% of inner and outer city 5-6 year olds children received clinical examinations in school by trained and calibrated clinicians as part of a national dental epidemiology programme.
Limitations	The study was not intended to prove that water fluoridation is effective. Not able to precisely determine which wards were within the water supply zones of the designated three water treatment works.
Link	http://www.ncbi.nlm.nih.gov/pubmed/21485232

Title	**Assessing and managing fluorosis risk in children and adults in rural Madhya Pradesh, India**
Year	2011
Abstract	This paper presents the application of quantitative chemical risk assessment for assessing and managing fluorosis in 19 schools and 6 villages in Madhya Pradesh, India. A longitudinal study was undertaken with a baseline survey in 2005 and an endline in 2007. Household surveys, water quality and food analysis were undertaken to measure the impact of an Integrated Fluorosis Mitigation programme that included water and nutritional interventions. The baseline survey indicated a maximum fluoride content of 7.8 mg/l in food and 3.7 mg/l in water, equating to a maximum fluoride uptake of 4.8 and 3.7 mg/l in food and water respectively. Mean (actual) daily intake of fluoride for all exposure routes was 0.4 mg/kg of combined

	adult and child body weight. Intake of fluoride through food was more than 40% of total intake. Calculated guideline values for age groups <18 years and >18 years were 1.7 and 1.9 mg/l respectively. Using WHO methodology, the Guideline Value would be 1.7 mg/l. Fluoride dilution was implemented to reduce the fluoride content to below this level. The endline survey indicated reduction in the prevalence of grade 1 fluorosis of 86%, of grade 2 of 77%, of grade 4 of 60% in all children examined.
Key Points	High levels of fluoride in water and food led to high prevalence of dental fluorosis (49.9%) and evidence of skeletal fluorosis (11.8%) Mitigation measures such as diluting groundwater with rainwater led to a reduction in the prevalence of fluorosis.
Strengths	Very comprehensive, scientifically rigorous study.
Limitations	Small area study. Not relevant to the New Zealand context as the study is concerned with reducing naturally very high water fluoride concentrations to reduce fluorosis prevalence in an area where it is endemic.
Link	http://www.iwaponline.com/washdev/001/washdev0010136.htm

Title	**Quality of Drinking water fluoridation of Capão Bonito, SP, Brazil, evaluated by operational and external controls**
Year	2011
	Purpose: To evaluate the quality of drinking water fluoridation of Capão Bonito, SP, Brazil, whose optimal fluoride concentration should be between 0.6 to 0.8ppm F, considering the balance benefits/risks. Methods: Historical records (n=1,964) from 2005 to 2009 of the water treatment plant (operational control) were evaluated. Also, from July 2009 to June 2010, 120 samples of the network water were collected for analysis and the fluoride concentrations found (external control) were compared with records of operational control of the same period. Results: According to the historical records, 76.3% of the samples had acceptable fluoride concentration and this value was confirmed by the external control done during one year, which found that 80.8% of samples were within the optimal range. However, considering the samples out the optimal range, while the records of the operational control showed values below the minimum, the results of the external control found higher percentage of samples above the maximum.
Conclusion	The data show the relevance to have a quality control of drinking water fluoridation because at same time the operational control analysis suggests that certain percentage of the population would not be receiving anti-caries benefits, the external control indicates that it would be in increased risk of fluorosis.
Key Points	Water fluoridation became mandatory in Brazil in 1974. The recommended optimal concentration for fluoride in drinking water in Brazil (based on climate) is 0.6 - 0.8ppm.

	Whilst water companies monitor fluoride concentrations, recent independent studies demonstrate a variation in fluoride concentration outside the optimal range. This study compared reported fluoride concentrations from operational records with water samples taken from test sites throughout the area. Sites selected for independent analysis were divided – 6 urban, 4 rural, and coded to ensure a 'blind' fluoride analysis was conducted. All were collected on the same day at the same time. Operational records indicated 76% of samples had fluoride concentrations within the optimal range: 20% of samples had fluoride at <0.6ppm and 4% of samples had fluoride at >0.8ppm. Highest recorded concentration was 5.43ppm and lowest was <0.1ppm. The percentage of samples from rural areas which were outside the optimal range was greater than those for urban areas. Of sample collected specifically for the current study (n=120), 80.8% had fluoride concentrations within the optimal range. 12.5% had concentrations >0.8ppm and 6.7% had concentrations <0.6ppm. Minimum concentration found was 0.08ppm and maximum concentration was 1.8ppm. Discrepancies between operational records and primary data might be due to: different methods of fluoride analysis or fluctuations in fluoride concentrations over time as samples were collected at different points in the month and at different times of day. Fluctuations are unlikely to affect either the risks or benefits from fluoride as these are based on long term exposure. (The 0.08ppm fluoride concentration was found in an area whose average fluoride concentration was 0.7ppm over the period of the study. Likewise the 1.8ppm level found was from an area whose average fluoride concentration was 0.8ppm). The study highlights the difficulty of maintaining optimal water fluoride levels, particularly in rural areas dependent on well water.
Strengths	Study was blinded. Long term analysis undertaken with consistency in sample collection both over time and between sites.
Limitations	Sample collection for study did not reflect operational collection practices, which may have led to part of the discrepancy between results recorded.
Link	http://www.scielo.br/scielo.php?pid=S1980-65232011000400002&script=sci_arttext

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