NSW HEALTH

Fluoridation of Public Water Supplies Regulation 2007

Regulatory Impact Statement

REGULATORY IMPACT STATEMENT

TITLE OF REGULATORY PROPOSAL:	**Fluoridation of Public Water Supplies Regulation 2007**
PROPONENT:	**NSW Department of Health**
RESPONSIBLE MINISTER:	**The Hon Reba Meagher MP Minister for Health**
RELEVANT ACT:	**Fluoridation of Public Water Supplies Act 1957**

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1. Why is the regulation being reviewed?

The *Fluoridation of Public Water Supplies Regulation 2002* (the "existing Regulation") facilitates the operation of the *Fluoridation of Public Water Supplies Act 1957*. The Regulation thereby contributes to the fluoridation program that authorises and controls the addition of fluoride to public water supplies in the interests of enhancing the oral health of the community. Controlling the addition of fluoride to public water supplies ensures that it is added in appropriate concentrations so as to deliver optimum oral health benefits without allowing the concentration to rise to a level that could pose a risk to public health.

The *Subordinate Legislation Act 1989* provides for regulations to have a limited life. In most cases, regulations are automatically repealed after 5 years. When a regulation is due for repeal, the responsible agency must review the regulation, its social and economic impacts, and the need for the regulation. The agency must then make a decision about whether the regulation should be remade. The results of this review are required to be published in a Regulatory Impact Statement (RIS) and submissions invited from the public.

This RIS proposes that the existing Regulation be remade.

2. Approach taken in this regulatory impact statement

The RIS first considers the objectives of proposed *Fluoridation of Public Water Supplies Regulation 2007* (the "proposed Regulation"). The RIS then considers the basis and rationale for each of the matters contained in the proposed Regulation. The RIS also examines the following options:

- Allowing the Regulation to lapse;
- Remaking the Regulation with amendments to incorporate those matters currently addressed by the Fluoridation Code; and
- Remaking the existing Regulation.

Submissions about the proposed Regulation can be made to:

Legal and Legislative Services Branch
NSW Department of Health
Locked Bag 961
NORTH SYDNEY 2059

Submissions may also be made via email to imartin@doh.health.nsw.gov.au

3. Objectives and operation of the regulatory proposal

3.1 The objectives of the proposed Regulation

The Objectives of the proposed Regulation are to facilitate the operation of the Fluoridation of Public Water Supplies Act 1957 (the Act), and to contribute to the fluoridation program that authorises and controls the addition of fluoride to public water supplies in the interests of enhancing the oral health of the community. Controlling the addition of fluoride to public water supplies ensures that it is added in appropriate concentrations so as to deliver optimum oral health benefits without allowing the concentration to rise to a level that could pose a risk to public health.

The proposed Regulation provides for:

- The application of the Code of Practice for the Fluoridation of Public Water Supplies (the Fluoridation Code);
- The offence of making substantial alterations to a fluoridated water supply without approval;
- Analysis of fluoridated water supplies;
- Fluoridation to be carried out by qualified operators;
- Security of plant rooms; and
- The keeping of records.

3.2 The operation of the Fluoridation of Public Water Supplies Act 1957

The Act authorises the addition of fluoride to a public water supply. Where public water supplies are to be fluoridated, water supply authorities must follow the approval and monitoring procedures under the Act. The Regulations support and give effect to these functions.

3.3 Fluoridation Code

The Fluoridation of Public Water Supplies Regulation 2002 (the 2002 Regulation) largely relies on the Fluoridation Code for its efficacy, and to a large extent the Code is enforced by operation of the Regulation. The Code incorporates details of the administrative and technical requirements that water supply authorities are to meet and the material that the Director-General requires when assessing an application.

The Fluoridation Code is a publicly available document which is published in the Government Gazette. The current version of the Code (attached to this RIS) was published in the Government Gazette on 30 August 2002.

3.4 Interaction of the Act, the Regulation and the Code

The Act sets out the basic framework for the fluoridation of public water supplies and allows for the making of regulations and adoption by regulation of standards, rules and codes for the purposes of facilitating the fluoridation of public water supplies.

The Regulation deals with a number of machinery matters such as applications for approval to fluoridate, the equipment that may be used to fluoridate a water supply, analysis of water samples and the keeping of records. The matters dealt with in the Regulation are then picked up by the Code, which provides detailed information on

the obligations of water supply authorities and the means by which those obligations may be met.

4. Impact of Water Fluoridation

4.1 Extent of water fluoridation

Over 80 water supply authorities including Sydney Water and Hunter Water provide fluoridated water to the NSW community. The local water supply authorities that fluoridate water supplies do so through 95 fluoridation plants.

It is estimated that fluoridated drinking water is currently available to approximately 6.3 million people in NSW representing 91.4% of the population, although it is only some 60% of people outside Sydney/Newcastle/Wollongong who have access to fluoridated water. It is also estimated that, in accordance with recently issued approvals and directions to fluoridate, by the end of 2007 94.2% of the population will have access to fluoridated water and by 2008/9 this will have risen to 97% of the population.

4.2 Benefits of water fluoridation

The Department of Health's Dental Health Unit (now the Oral Health Branch) conducted a study[1] in 1993 of the incidence of dental caries in the deciduous dentition of school children in the Hawkesbury local government area (fluoridated) and the Upper Blue Mountains local government area (then unfluoridated). The study showed that those school children without access to fluoridated water had on average a threefold increase in the number of dental caries.

In 1999 the National Health and Medical Research Council published a Review of Water Fluoridation and Fluoride Intake from Discretionary Fluoride Supplements. The conclusions of that review were:

1. Water fluoridation at optimal levels, varying from 0.6 ppm in sub-tropical regions to 1.1 ppm in temperate climates, continues to provide significant benefits in the prevention of dental caries for both deciduous and permanent teeth. The evidence for a protective effect on dental health is strongest in childhood but can also be demonstrated in adults.
2. Communities that have ceased water fluoridation have a demonstrated increase in caries experience.
3. Fluoridation of water at optimal levels, varying from 0.6 ppm in sub-tropical regions to 1.1 ppm in temperate climates, remains the most effective and socially equitable means of achieving community-wide exposure to the caries-preventive effects of fluoride. It should remain unchanged until evidence accumulates that further action on fluoride exposure is required.
4. There is evidence of increased dental fluorosis in communities exposed to a combination of optimally fluoridated drinking water (0.6-1.1 ppm subject to

[1]. Patterson AF, Weidenhofer RNG. *A study of the dental health of primary school children in the local government areas of the Blue Mountains and Hawkesbury NSW, 1993.* (Sydney, Dental Health Unit NSW Department of Health, 1993).

climate) and contemporary discretionary sources of fluoride. In a population with low caries experience, any marginal benefit from further exposure to discretionary fluoride comes with the greater risk of dental fluorosis with its attendant social and economic costs.

5. There is a continued need for some children to avoid excessive intake of fluoride from discretionary sources of fluoride such as infant formulae, toothpaste and inappropriate use of fluoride supplements.
6. Reduction of long-term exposure to fluoride would be best achieved by reducing the use of supplements and the level of fluoride in infant formulae and toothpaste. Reduction of the long-term exposure of the community to fluoride through lowered concentrations in reticulated drinking water should be considered only after assessing the effects on dental health of the above strategy.
7. There is a continued need in Australia for improved monitoring of the dental health of both children and adults, in particular to monitor fluoride intake and the occurrence of dental fluorosis, to identify risk factors and retain a dental health scheme which is both cost beneficial and effective.
8. There is insufficient evidence to establish a link between fluoridated drinking water and an increased risk of bone or other cancers.
9. The evidence does not suggest an increased risk of osteoporosis from exposure to drinking water fluoridated at optimal levels of 0.6.-1.1 ppm subject to climate.
10. While fluoride therapy is associated with an increase in bone mineral density, evidence of its benefit in the treatment of osteoporosis is inconclusive.

The NHMRC review also reported that:

"Australia has one of the lowest figures for caries disease, similar to Singapore. Australian studies (Riordan, 1991) have demonstrated DMFT [diseased, missing or filled permanent teeth] below the WHO recommendation in both fluoridated and non-fluoridated communities, lower caries in fluoridated areas (Riordan, 1991; Patterson, 1993; Slade, 1995; Slade, 1996a, b) and higher caries for children from low socio-economic backgrounds especially in non-fluoridated areas (Patterson, 1993; Slade 1996) including aboriginal children (Seow et al, 1996). Multivariate analysis has indicated that water fluoridation was associated with lower DMFT scores (Riordan, 1991).

Dental caries experience in 12 year-old Australian children declined by about 50% (DMFT 9 to 4.5) in the 20 years from 1955-1975 and there was a further decline of about 78% (DMFT 4.5 to 1) in the 20 years from 1975-1995. Australian Institute of Health and Welfare Dental Statistics and Research Unit unpublished data show a marked downward trend in caries experience in children aged 6-12 years with time with a projected DMFT for 12-year-olds in 1998 of 0.84 which is lower than the Australian Better Health Commission national oral health target for 2000 of 1.0. The figure for 1995 was 1.01 which is well below the international target for the year 2000 of 3.0 set by the WHO (FDI 1982). It also compares very favourably with figures from other countries (Bolin, 1997; Bjarnason, 1998)…"[2]

[2] NHMRC, chapter 5 page 6.

Since the publication of those figures by the NHMRC that average DFMT rate in NSW 12 year olds has dropped to 0.65 with the rate for Tamworth (fluoridated since 1963) at 0.40.[3]

The NHMRC's review includes the following conclusions in chapter 5:

- Significant benefits in preventing dental caries in deciduous teeth from water fluoridation.
- Significant benefits in preventing dental caries in permanent teeth from water fluoridation.
- Association between fluoride exposure and caries experience is stronger for deciduous than permanent teeth.
- There has been a narrowing of the relative caries differences between children in fluoridated and non-fluoridated communities.
- Protective effect on dental health of water fluoridation demonstrated in adults.

An earlier report by the NHMRC[4] concluded that Australian data, comparing capital cities with different fluoridation histories, indicates that exposure to fluoridated water throughout childhood reduces the occurrence of dental decay by around one quarter. Overseas studies, both in children and adults, have found similar beneficial effects (a literature search is provided as **Appendix A**).

Historical data examined by the NHMRC[5] suggests that fluoridation of water has previously delivered a reduction of dental caries in permanent dentition of between 50 and 60% and in deciduous dentition of between 40 and 50%. Fluoridation of public water supplies currently generates an estimated annual reduction in dental caries of 20-40% in Western populations. Based on figures in the Chief Health Officer's Report for 2006[6] of approximately 726,000 dental treatments for fillings and 394,000 dental treatments for extractions per annum in NSW this represents 220,000 to 440,000 dental treatments saved. The NSW branch of the Australian Dental Association (ADA) has advised that s at July 2006 the statewide average cost of a simple amalgam filling to a single tooth surface was $100. The ADA has also advised that the average cost of a simple tooth extraction was between $126 or $256 for a surgical extraction if performed by a general dentist or $156 for a simple extraction and $282 for a surgical extraction if performed by a specialist. Utilising the lowest of the figures for extractions this represents a saving to the NSW community of at least $24.4 million per annum in saved dental treatment.

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[3] Sivaneswaren S, *Water Fluoridation Successes in NSW 2003 – 2006*, Newsletter of the New South Wales Branch of the Public Health Association 24 (No 2) June 2006, pp7-10.

[4]. The Effectiveness of Water Fluoridation, Melbourne 1991

[5]. ibid.

[6] . The health of the people of New South Wales – Report of the Chief Health Officer (Sydney, NSW Department of Health, 2006)

These savings do not include any estimate for future savings resulting from oral health care not required in future years, including prosthetic dentistry, and the productivity savings to the community in general. An indication of the total of the savings available from fluoridation can be calculated from a US study[7] that concluded that water fluoridation results in annual overall savings to the community of $15.95 per person for small communities (<5,000 people) and up to $18.62 per person for larger communities (>20,000 people) (reflecting economies of scale). If the lower figure were used as a basis for calculating the benefit to NSW of water fluoridation the benefit would be over $100 million per annum. This calculation does not seek to include any benefits that would flow to residents of areas without water fluoridation, although clearly certain benefits would flow on to members of those communities through consuming bottled drinks made with fluoridated water and so on.

5. Regulatory Options

5.1 Options

The regulatory options that have been considered are:

Option 1 *(the do nothing option)* – By action of the *Subordinate Legislation Act 1989* the current Fluoridation of Public Water Supplies Regulation 2002 would cease on 1 September 2007 with no new Regulation made.

Option 2 - The 2002 Regulation would be remade with amendments to incorporate in the Regulation of many of those matters currently addressed by the Fluoridation Code.

Option 3 – The 2002 Regulation is remade without substantive amendment.

5.2 Option 1: Repeal of the Fluoridation of Public Water Supplies Regulation

This option would not achieve the objectives detailed above.

Repealing the Regulation would result in a less effective administration of the Act. In essence if this option was adopted the Code would become unenforceable and compliance with the Code would become entirely voluntary, other than via conditions imposed by the Director-General on an authorisation. Implementing the requirements of the Regulation and the Code via conditions on approvals would be administratively highly inefficient and potentially confusing for both administrators and for water supply authorities.

There is a real risk that adoption of this approach could, over a number of years, result in a significant reduction in the proportion of the NSW population that has access to fluoridated water. This is likely to result in a significant increase in dental caries, both in children and, over a longer time period, adults with a substantial increase in treatment costs to the community.

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[7] Griffin SO, Jones K, Tomar SL, *An economic evaluation of community water fluoridation*. Journal of Public Health Dentistry 2001, 61(2): 78-86.

5.3 Option 2: Remake the Regulation with amendments to incorporate the Fluoridation Code in the Regulation.

This option would facilitate the continued effective implementation of the Fluoridation of Public Water Supplies Act and thereby the continued delivery of oral health benefits to the community.

However, a large degree of administrative flexibility would be lost with all changes to practise requiring amendment of the Regulation rather than of the Code. Amendment of the Regulation requires the involvement of the Parliamentary Counsel's Office, approval by both the Minister for Health and the Governor and publication in the Government Gazette. Amendment of the Code involves approval by the Fluoridation of Public Water Supplies Advisory Committee, which is appointed by the Minister, and publication in the Government Gazette.

5.4 Option 3: Remake the Regulation without amendment.

This option will facilitate the continued effective implementation of the Fluoridation of Public Water Supplies Act and thereby the continued delivery of the oral health benefits to the community as described above in **part 2**. This option would thereby achieve the objectives of the Regulation.

6. Costs And Benefits

6.1 Costs of the proposed Regulation

The proposed Regulation is largely machinery in nature and facilitates the operation of the Act rather than imposing additional controls and costs on water supply authorities.

Costs have been calculated in terms of the entire fluoridation scheme as it is not feasible to separate those portions of the costs associated solely with the Regulation.

6.1.1 Administration costs

Administration of the entire fluoridation scheme, comprising the Act, the Regulation and the Code, by the Department of Health, including approving fluoridation facilities and modifications to plants is assumed to require one full time equivalent position per annum. The cost of administration is calculated based on an annual salary of $60,000 plus 35% on-costs, or $81,000 per annum.

6.1.2 Alterations to a water supply or plant and equipment

Clause 7 of the proposed Regulation provides that a water supply authority must obtain written approval before making substantial alterations to its water supply, to the fluoridation equipment, or to those parts of the water supply plant that are in close proximity to the point at which fluoride is added to the water supply. The reasons for each of these requirements is to ensure that fluoride is continuously added to the water supply in the appropriate concentrations so that oral health benefits are delivered without any risk of fluoride levels increasing to a level that may cause any adverse health consequences in the community.

Approximately five applications are made each year. NSW Health has a dedicated budget of up to $200,000 per annum for these capital upgrades and alterations. In most years the full budget is not spent.

6.1.3 Analysis of water samples and record keeping requirements

Clause 8 of the Regulation requires a water supply authority to collect and analyse water samples as required by the Fluoridation Code. The provision also requires the water supply authority to send the results of its analyses and a further water sample to the persons required by the Fluoridation Code.

The purpose of this provision is to ensure that water supply authorities regularly monitor the levels of fluoride in their water supplies and report the results of that monitoring (or instances where the levels of fluoride are outside allowed limits) so that strategies may be employed to manage any public health risks associated with those fluoride levels.

The Fluoridation Code requires testing of the levels of fluoride in the water supply for the purposes of ensuring that the dosing equipment is properly calibrated. However the Code does not specify frequency of testing, which is therefore to be undertaken based on a local risk assessment and as required. The Code also requires that the level of fluoride in water in the distribution system (that is the water actually delivered to consumers) is tested twice a week and that one sample per month is provided to the Division of Analytic Laboratories for verification. This sampling and testing is estimated to take on average one hour per sample, or two hours per week. Assuming that staff involved in testing earn $60,000 per annum, plus 35% on-costs, this equates to a cost of approximately $3,375 per plant per year.

Clause 11 of the Regulation requires that water supply authorities keep records as required by the Fluoridation Code and send copies of those records to the Director-General as required. Records may be stored in electronic or paper form and are to be retained for two years. The inspection of facilities and keeping of records is estimated to involve 30 minutes per plant per day or 3.5 hours per week. This is estimated to involve a cost of approximately $7,000 per plant per annum.

6.1.4 Operational matters

Clause 9 of the Regulation provides that only qualified operators may fluoridate a water supply. A qualified operator is a person who has completed a course of training in fluoridation recognised by the Fluoridation Code. The Code recognises the following courses:

a. A fluoride training course conducted by the Department of Health; or
b. NSW TAFE certificate in Water and Waste Water Treatment; or
c. Another course approved by the Director-General as being the equivalent of either (a) or (b).

Clause 10 of the Regulation provides that fluoridation plants are to be kept locked at all times that a qualified operator is not in attendance. This provision is designed to help ensure that fluoride levels in water supplies are not affected by a person changing the settings on fluoridation plant either by accident or deliberately. However keeping a fluoridation plant secure would be expected to occur in any

event as simply the water supply authority protecting its investment and complying with the requirements of its public liability insurance. Therefore this provision does not impose costs on water supply authorities.

Fluoridation equipment is automated and requires limited operator intervention other than manual loading of the feeder hopper. This process is estimated to involve no more than 2 hours per week per plant and a cost of approximately $3,375 per plant per annum. (Although the requirement to add fluoride to water supplies is imposed by the Act rather than the Regulation it has been included in order to give a compete view of operational costs.)

6.2 Benefits of the proposed regulation

As discussed in **part 4.2** it is estimated that water fluoridation results in the need for between 220,000 and 440,000 fewer dental treatments (fillings and extractions) than would be required annually without fluoridation. This represents an estimated annual saving in dental care services in NSW of between $24.5 and $49 million per year.

It is also noted in **part 4.2** that a conservative estimate of overall annual benefit to the community of $15.95 per person can be attributed to water fluoridation. If this figure is used as a basis for calculating the benefit to NSW of water fluoridation the benefit would be over $100 million per annum. As noted in **Part 4.1** 91.4% of the NSW population (6.3 million people) currently enjoy access to fluoridated water, by the end of 2007 this is expected to rise to 94.2% (6.5 million) and by 2008/9 to 97% (6.7 million).

NSW Health currently estimates that the public health benefits from water fluoridation equate to a $30 return for each $1 spent (although independent studies have put the figure at a benefit of $38 for each $1 spent[8]).

While it is not possible to provide an estimate of the benefits that flow exclusively from the Regulation it is evident that the entire water fluoridation scheme provides a significant annual economic benefit to the NSW community.

7. Evaluation Of Options

7.1 Overall comparison and evaluation of the relative net costs and benefits of the Regulation

Option 1 – Repeal the Regulation

Repealing the Regulation would result in no direct administrative and compliance costs for water supply authorities. However it is likely that the provisions imposing these costs would be introduced via licence condition. There would therefore be no immediate saving for water supply authorities.

[8] . ibid.

However, as noted in **part 5.2** there is a real risk that adoption of this approach could, over a number of years, result in a significant reduction in the proportion of the NSW population that has access to fluoridated water. This is likely to result in a significant increase in dental caries, both in children and, over a longer time period, adults, with a substantial increase in treatment costs to the community.

Option 2 – Remake the Regulation with amendments to incorporate the Fluoridation Code in the Regulation.
Remaking the Regulation with amendments to incorporate the Fluoridation Code into the Regulation will remove a large degree of administrative and operational flexibility that is currently provided by the separate Code and require additional administration by the Department of Health. It is anticipated that this additional administration would require and additional 0.5 FTE positions.

The more detailed nature of the Regulation may also result in additional compliance activity by water authorities. This additional compliance activity may involve more extensive reporting and monitoring requirements, as prescribed requirements would have to be set on a lowest common denominator basis rather than allowing those requirements to be tailored on a risk management basis.

The full benefits of water fluoridation to the Community would be expected to be achieved under this option with the loss of some administrative flexibility both for the Department of Health and for water supply authorities.

Option 3 – Remake the Regulation without amendment
Remaking the Regulation is expected to result in no additional administrative costs for the Department of Health or water supply authorities.

It is expected that this approach would deliver maximum oral health benefits to the community.

OPTION	COSTS (ANNUAL)	BENEFITS (ANNUAL)	NET (OVER 5 YEARS)
Option 1 No regulation	Nil	< $100 million (and decreasing)	< $500 million
Option 2 Amendment of the Regulation to include the Fluoridation Code	<u>Administration</u> employment of 1.5 staff (FTE) $121,000 <u>Capital upgrades</u> $200,000 <u>Operational</u> $13,750 per plant for 95 plants $1.31 million	$100 million in yr 1 $104 million in yrs 2 & 3 $107 million in yrs 4 and 5	$515 million
Option 3	<u>Administration</u>	$100 million in yr 1	$515 million

The current Regulation	Employment of 1 staff (FTE) $81,000 <u>Capital upgrades</u> $200,000 <u>Operational</u> $13,750 per plant for 95 plants $1.31 million	$104 million in yrs 2 & 3 $107 million in yrs 4 and 5	

7.2 Justification for selecting or rejecting the proposed subordinate legislative amendments

The benefit, over the do nothing option, of retaining the present Regulation, either with amendments or unchanged, is at least $15 million over the life of the proposed Regulation.

The benefit of retaining the current Regulation unchanged over the option of amending the Regulation to incorporate those matters currently dealt with by the Fluoridation Code is a very small decrease in administrative costs and a possible minor decrease in operational costs for water supply authorities.

The proposed option (Option 3) will meet the objectives of the Regulation by maintaining the benefits of water fluoridation for the greatest portion of the NSW community at the lowest cost.

8. Consultation

Comments have been sought from the following stakeholder organisations:

Australian Dental Association (NSW)
Australian Medical Association (NSW)
Hunter Water Corporation Ltd.
Local Government and Shires Associations of NSW
Sydney Water Corporation Ltd.

Prior to the preparation of this RIS submissions were received from the following organisations and individuals:

Central Coast Pure Water Association Inc
Citizens Against Fluoridation Mid North Coast Inc
Councillor Gavin Smith (Coffs Harbour City Council)
Ms Anne Higginson
Sydney Water.

All stakeholders will be provided with an opportunity to comment on the draft Regulation and this Regulatory Impact Statement. In addition the draft Regulation and the Regulatory Impact Statement will be published on the Department of Health's Internet site and advertised in major metropolitan newspapers. A four week period will be provided for public consultation and all submissions will be considered prior to the Regulation being finalised and submitted to the Minister for Health and the Governor for approval.

9. Attachments

Proposed Fluoridation of Public Water Supplies Regulation 2007
Fluoridation Code of Practise

Appendix A – Literature Review

Cost/benefit assessment of water fluoridation

Griffin SO, Jones K, Tomar SL (2001) undertook research (in the United States) to assess the local cost savings resulting from community water fluoridation, given current exposure levels to other fluoride sources. The authors conclude that the annual per person cost savings resulting from fluoridation ranged from $15.95 in very small communities to $18.62 in large communities. On the basis of the most current data available on the effectiveness and cost of fluoridation, caries increment, and the cost and longevity of dental restorations water fluoridation was found to offer significant cost savings.

Doessel DP (1985) found that water fluoridation in Townsville (QLD) delivered significant economic benefits to the entire Townsville community over a wide range of conditions and under a wide range of assumptions.

Benefit to oral health associated with water fluoridation

Jones CM, Worthington H (2000) examined the influence of water fluoridation, and socio-economic deprivation on tooth decay in the permanent dentition of 12 year old children in the North of England. The study found that social deprivation and tooth decay were significantly correlated in areas with and without water fluoridation. Statistical analysis shows that the more deprived the area the greater the impact of water fluoridation on the reduction in tooth decay.

Riley JC, Lennon MA, Ellwood RP (1999) studied the effect that water fluoridation has upon the association between material deprivation and dental caries experience in 5-year-old children. The authors conclude that water fluoridation reduces dental caries experience more in materially deprived areas than in affluent areas and the introduction of water fluoridation in unfluoridated areas would substantially reduce inequalities in dental health.

Horowitz HS (1996) reports that water fluoridation remains as effective as it ever was among groups at high risk to dental caries. Contrary to early beliefs that stressed the importance of preeruptive fluoride exposure, fluoridation also provides an important source of topical fluoride and facilitates remineralization.

Spencer AJ, Slade GD, Davies M (1996) reviewed the rationale, context and support for water fluoridation in Australia, and examines current Australian evidence concerning the caries-preventive effects of fluoridation and trends in dental fluorosis. Australian oral epidemiological studies consistently support the accumulated evidence on the effectiveness of water fluoridation. This includes recent evidence that lifetime exposure to fluoridation is associated with average reductions of 2.0 dmfs and between 0.12 and 0.30 DMFS per child compared with non-exposed children. Water fluoridation has been found to reduce socio-economic inequalities in caries, reducing the differential between high and low socio-economic status groups by approximately 1.0 dmfs and 0.2 DMFS per child. The prevalence of dental

fluorosis may have increased, prompting renewed consideration of overall exposure to fluorides. Action is currently being taken to reduce the exposure to discretionary fluoride among pre-school children as part of a targeted approach to adjusting the benefit-risk relationship of exposure to fluorides for that age group. Community water fluoridation continues to be the most effective and socially equitable measure for caries prevention among all ages by achieving community-wide exposure to the caries preventive effects of fluoride.

Attwood D. Blinkhorn AS (1991) In 1988 the authors undertook a study of the dental health of children resident in two towns in south-west Scotland, one of which had fluoridated water until 1983. Comparison with an identical 1980 study allowed trends in the prevalence of caries to be examined. In 1988, the mean, decayed, missing and filled deciduous teeth (dmft) score for 5-year-old children in Stranraer, the formerly fluoridated town, was 3.08, 24 per cent worse than the score of 2.48 reported in 1980. In Annan, mean dmft for 5-year-old children was 3.18 in 1988, 27 per cent lower than the 1980 dmft score of 4.38. The difference in caries prevalence between the two towns in 1988 was a non-significant 3.1 per cent compared with the 44 per cent difference found in 1980. Similar trends in caries prevalence were also found in 10-year-old children with mean DMFT scores of 2.28 in Stranraer and 2.56 in Annan in 1988, a 10.9 per cent difference compared with the 50 per cent difference reported in 1980. The Stranraer DMFT score was 37.4 per cent higher than the DMFT of 1.66 recorded in 1980, while in Annan, the mean DMFT of 2.56 was 23.6 per cent lower than the 1980 score of 3.35. The comparison confirms a trend to lower caries levels in Annan children in line with the general trend in caries prevalence in much of western Europe. However, despite the almost universal use of fluoride toothpaste, caries prevalence in Stranraer children increased following the cessation of fluoridation to almost parity with children in the non-fluoridated area. This study shows that there is still a benefit to be gained in terms of lower caries rates by implementing water fluoridation despite the general decline in dental caries.

Appendix B - Bibliography

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