



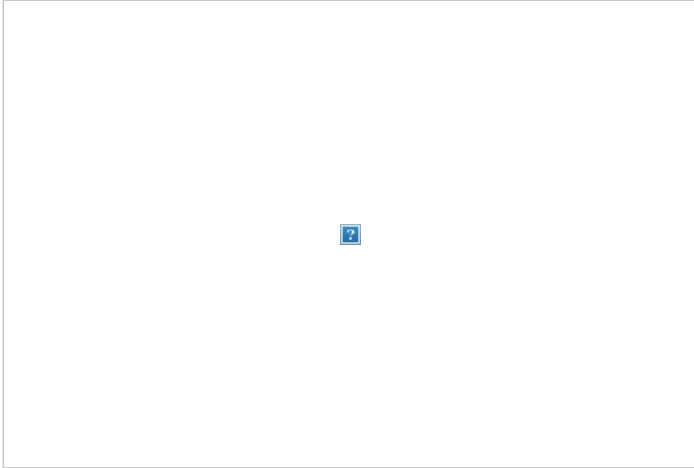
Fluoride Action Network

August 30, 2001

Tooth Decay Trends: Fluoridated Vs. Unfluoridated Countries

Over the past 50 years, there has been a large decline in cavities in the United States. Fluoridation proponents like to claim that this reduction in cavities is a result of water fluoridation. For instance, in 1999, when the CDC nominated fluoridation as one of the top 10 public health achievements of the 20th century, it published a graph (Figure 1), which shows the reduction of cavities in the US coupled with the increase in water systems that have been fluoridated ([MMWR, October 22, 1999](#)). The CDC referred to the graph with the statement: "as a result [of water fluoridation], dental caries declined precipitously during the second half of the 20th century."

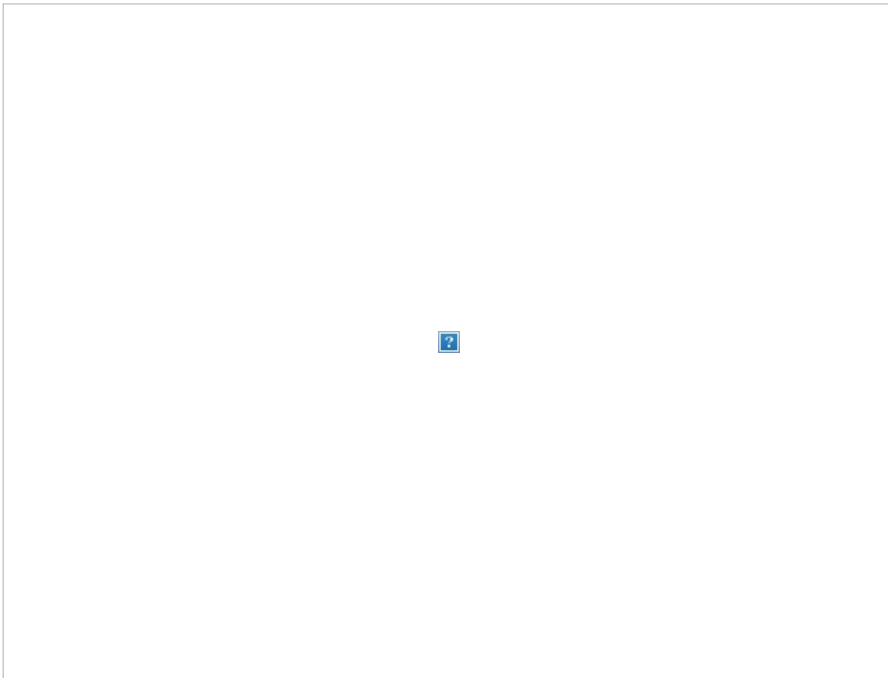
Figure 1. Decline of DMFT (Decayed, Missing, or Filled Teeth) in the US among 12 year old children. (CDC, 1999).



However, what the CDC fails to mention - both in 1999 and in its most recent report (August 2001) - is that this same decline in cavities has occurred in virtually every industrialized country, most of which do **NOT** fluoridate.

If CDC's interest was in providing an intelligent discussion on the issue of water fluoridation, they would have acknowledged that un-fluoridated countries such as Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, and Sweden have experienced the same or greater declines in cavities as compared to the US (Figure 2). To not acknowledge this, but instead ignore it and claim that the decline of cavities in the US is a result of water fluoridation, is both myopic and grossly misleading. It's certainly not the kind of service one would expect from a science-based agency operating at the public's expense.

Figure 2: Tooth Decay Trends for 12 Year Olds: Fluoridated Vs. Unfluoridated Countries. Data from World Health Organization. (Graph by Chris Neurath).



For further information see:

[Why I Changed My Mind about Water Fluoridation](#) *Perspectives in Biology and Medicine* 41 29-44 1997

[Cavities Not Increasing When Fluoridation Stops](#) *Fluoride Action Network* February 2001

[Water Fluoridation & Tooth Decay: Results from the 1986-1987 National Survey of US Schoolchildren](#) *Fluoride* Volume 23 No. 2, 4 pp. 1999

Recent Findings on Fluoridation's Effectiveness:

"An analysis of national survey data collected by the National Institute of Dental Research (NIDR) concludes that **children who live in areas of the U.S. where the water supplies are fluoridated have tooth decay rates nearly identical with those who live in nonfluoridated areas.**" - Hileman, B. (1989). *New Studies Cast Doubt on Fluoridation Benefits*. *Chemical & Engineering News*. May 8. <http://www.fluoridealert.org/NIDR.htm>

"**The magnitude of [fluoridation's] effect is not large in absolute terms, is often not statistically significant and may not be of clinical significance.**" - Locker, D. (1999). *Benefits and Risks of Water Fluoridation. An Update of the 1996 Federal-Provincial Sub-committee Report*. Prepared for Ontario Ministry of Health and Long Term Care.

"**Even when very large sample sizes are used to obtain statistically significant results, the benefit of water fluoridation is not a clinically relevant one.**" - Dr. Hardy Limeback, Head, Preventive Dentistry, University of Toronto. (2000). *Why I am now Officially Opposed to Adding Fluoride to Drinking Water*.

"**Data from Head Start surveys show the prevalence of baby bottle tooth decay is about three times the national average among poor urban children, even in communities with a fluoridated water supply.**" - Von Burg MM et al. (1995). *Baby Bottle Tooth Decay: A Concern for All Mothers*. *Pediatric Nursing*. 21:515-519.

"**Children attending centers showed no significant differences [in baby bottle tooth decay] based on fluoride status for the total sample.**" - Barnes GP et al. (1992). *Ethnicity, Location, Age, and Fluoridation Factors in Baby Bottle Tooth Decay and Caries Prevalence of Head Start Children*. *Public Health Reports*. 107: 167-73.

"**While Boston's water supply has contained tooth-decay fighting fluoride since 1978...eighteen percent of children 4 years old and younger who were seen in the pediatric program at Tufts University School of Dental Medicine in 1995 had baby-bottle tooth decay, a painful condition that arises when a baby is given a bottle of juice or milk at bedtime.** Treatment can cost up to \$4,000 per child. About 90 percent of 107 Boston high school students were found to need dental treatment, according to a 1996 unpublished study. That report also estimated that **the city's students had four times more untreated cavities than the national average.**" - Kong D. (1999). *City to launch battle against dental 'crisis'*. *Boston Globe*. Nov. 27. <http://www.fluoridealert.org/f-boston.htm>

"**[R]esults of recent large-scale studies in at least three countries show that, when similar communities are compared and the traditional DMFT index of dental caries is used, there is no detectable difference in caries prevalence.** This has been demonstrated for schoolchildren in the major cities of New Zealand, Australia, the US and elsewhere (33-38)." - Diesendorf, M. et al. (1997). *New Evidence on Fluoridation*. *Australian and New Zealand Journal of Public Health*. Vol. 21 No. 2:187-190.

"**[S]urvey results in British Columbia with only 11 per cent of the population using fluoridated water, show lower average DMFT rates than provinces with 40-70 percent of the population drinking fluoridated water. How does one explain this?"** - Gray, AS. (1987). *Fluoridation: Time for a New Base Line?* *Journal of the Canadian Dental Association*. 10: 763-765.

"**[S]chool districts recently reporting the highest caries free rates in [British Columbia], were totally unfluoridated.**" - Gray, AS. (1987). *Fluoridation: Time for a New Base Line?* *Journal of the Canadian Dental Association*. 10: 763-765.

"Recent studies and reports agree that the differences in dental decay prevalence between fluoridated and non-fluoridated areas in New Zealand are small. **For 12- and 13-year old children nationally the percentages who were caries-free in each kind of area differed by only 1 or 2 per cent, and were often higher in the non-fluoridated part of a health district.**" - Colquhoun, J. (1987). *Studies Child Dental Health Differences in New Zealand*. *Community Health Studies*. 6(3): 85-90.

"**[D]uring the period 1979-81, especially in western Europe where there is little fluoridation, a number of dental examinations were made and compared with surveys carried out a decade or so before. It soon became clear that large reductions in caries had been occurring in unfluoridated areas. The magnitudes of these reductions are generally comparable with those observed in fluoridated areas over similar periods of time.**" - Diesendorf, D. (1986). *The Mystery of Declining Tooth Decay*. *Nature*. 322(10): 125-129.

"From other lands - Australia, Britain, Canada, Sri Lanka, Greece, Malta, Spain, Hungary, and India - **a similar situation has been revealed: either little or no relation between water fluoride and tooth decay, or a positive one (more fluoride, more decay)** [12-17]." - Colquhoun, J. (1997). *Why I Changed My Mind About Water Fluoridation*. *Perspectives in Biology and Medicine* 41:29-44. <http://www.fluoride-journal.com/98-31-2/312103.htm>

"**Significantly (P < 0.01) more children had decayed teeth in the high F area than in the other two areas. The results suggest a positive association between high F levels in the drinking water and dental caries.**" - Grobler SR, et al. (2001). *Dental fluorosis and caries experience in relation to three different drinking water fluoride levels in South Africa*. *International Journal of Paediatric Dentistry* 11(5): 372-379.

"**Our findings indicate that dental caries was caused by high fluoride and low dietary calcium intakes, separately and through their interactions. Dental caries was most severe and complex in calcium-deficient children exposed to high intakes of endemic fluoride in drinking water.**" - Teotia SPS, Teotia M. (1994). *Dental Caries: A Disorder of High Fluoride and Low Dietary Calcium Interactions (30 Years of Personal Experience)*. *Fluoride*. Vol. 27 No. 2 59-66.

Recent Findings on Fluoridation-Cessation Effects:

"The fact that **no increase in caries was found in Kuopio despite discontinuation of water fluoridation** and decrease in preventive procedures suggests that not all of these measures were necessary for each child." - Seppa L, Karkkainen S, Hausen H. (2000). *Caries Trends 1992-1998 in Two Low-Fluoride Finnish Towns Formerly with and without Fluoridation*. *Caries Res* 34(6):462-468.

"**In contrast to the anticipated increase in dental caries following the cessation of water fluoridation in the cities Chemnitz and Plauen, a significant fall in caries prevalence was observed.**" - Kunzel W, Fischer T, Lorenz R, Bruhmann S. (2000). *Decline of caries prevalence after the cessation of water fluoridation in the former East Germany*. *Community Dentistry and Oral Epidemiology* 28(5):382-9.

"**In 1997, following the cessation of drinking water fluoridation, in contrast to an expected rise in caries prevalence, DMFT and DMFS values remained at a low level for the 6- to 9-year-olds and appeared to decrease for the 10/11-year-olds (from 1.1 to 0.8) and DMFS (from 1.5 to 1.2).** In the 12/13-year-olds, there was a significant decrease (DMFT from 2.1 to 1.1; DMFS from 3.1 to 1.5), while the percentage of caries-free children of this age group had increased from 4.8 (1973) and 33.3 (1982) up to 55.2%." - Kunzel W, Fischer T. (2000). *Caries prevalence after cessation of water fluoridation in La Salud, Cuba*. *Caries Research* 34(1):20-5.

"**The prevalence of caries (assessed in 5,927 children, grades 2, 3, 8, 9) decreased over time in the fluoridation-ended community while remaining unchanged in the fluoridated community.**" - Maupome G, Clark DC, Levy SM, Berkowitz J. (2001). *Patterns of dental caries following the cessation of water fluoridation*. *Community Dentistry and Oral Epidemiology* 29(1):37-47.

Mechanism of Action - Topical Vs. Systemic:

(*Note: When water fluoridation first began proponents believed fluoride had to be swallowed - and at a young age - to be effective. This view - which was used to justify adding fluoride to the water supply - is now being increasingly challenged by more and more dental researchers who are finding that fluoride needs to be applied topically in order to be effective.*)

"**Recent research on the mechanism of action of fluoride in reducing the prevalence of dental caries (tooth decay) in humans shows that fluoride acts topically (at the surface of the teeth) and that there is negligible benefit in ingesting it.**" - Diesendorf, M. et al. (1997). *New Evidence on Fluoridation*. *Australian and New Zealand Journal of Public Health*. Vol. 21 No. 2:187-190.

"**[L]aboratory and epidemiologic research suggests that fluoride prevents dental caries predominately after eruption of the tooth**

topical for both adults and children." - Centers for Disease Control and Prevention. (1999). *Achievements in Public Health, 1900-1999: Fluoridation of Drinking Water to Prevent Dental Caries*. MMWR, 48(41): 933-940.

"[F]luoride's predominant effect is posteruptive and topical." - Centers for Disease Control and Prevention. (2001). *Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States*. Mortality and Morbidity Weekly Review. August 17, 50(RR14):1-42.

"[E]vidence has continued to accumulate to support the hypothesis that the anti-caries mechanism of fluoride is mainly a topical one." - J Carlos, JP. (1983) *Comments on Fluoride*. The Journal of Pedodontics. Winter: 135-136.

"Fluoride...works via topical mechanisms." - Featherstone, JDB. (2000). *The Science and Practice of Caries Prevention*. Journal of the American Dental Association. 131: 887-899.

"Fluoride incorporated during tooth development is insufficient to play a significant role in caries protection." - Featherstone, JDB. (2000). *The Science and Practice of Caries Prevention*. Journal of the American Dental Association. 131: 887-899.

"[R]esearchers are discovering that the topical effects of fluoride are likely to mask any benefits that ingesting fluoride might have... This has obvious implications for the use of systemic fluorides to prevent dental caries." - Limeback, H. (1999). *A re-examination of the pre-eruptive and post-eruptive mechanism of the anti-caries effects of fluoride: is there any caries benefit from swallowing fluoride?* Community Dentistry and Oral Epidemiology. 27:62-71.

"Until recently most caries preventive programs using fluoride have aimed at incorporating fluoride into the dental enamel. The relative role of enamel fluoride in caries prevention is now increasingly questioned, and based on rat experiments and reevaluation of human clinical data, it appears to be of minor importance." - Fejerskov O, Thylstrup A, Larsen MJ. (1981). *Rational Use of Fluorides in Caries Prevention: A Concept based on Possible Cariostatic Mechanisms*. Acta. Odontol. Scand. Vol. 39: 241-249.

"Although it was initially thought that the main mode of action of fluoride was through its incorporation into enamel, thereby reducing the solubility of the enamel, this pre-eruptive effect is likely to be minor." - Locker, D. (1999). *Benefits and Risks of Water Fluoridation. An Update of the 1996 Federal-Provincial Sub-committee Report*. Prepared for Ontario Ministry of Health and Long Term Care.

"[F]luoride's pre-eruptive effects in caries prevention are weak." - Burt, BA. (1994). *The Case for Eliminating the Use of Dietary Fluoride Supplements Among Young Children*. Abstract of paper presented at Dietary Supplement Conference, American Dental Association, Chicago, Illinois, January 31 - February 1.

"The insignificant role played by such small amounts of incorporated fluoride in [enamel] is illustrated by observations in vitro when teeth formed in <<low>> and <<optimal>> fluoride areas developed exactly similar lesions after continuous exposure to an acidified gel." - Fejerskov O, Thylstrup A, Larsen MJ. (1981). *Rational Use of Fluorides in Caries Prevention: A Concept based on Possible Cariostatic Mechanisms*. Acta. Odontol. Scand. Vol. 39: 241-249.

"[A]ny method which places particular emphasis on incorporation of bound fluoride into dental enamel during formation may be of limited importance." - Fejerskov O, Thylstrup A, Larsen MJ. (1981). *Rational Use of Fluorides in Caries Prevention: A Concept based on Possible Cariostatic Mechanisms*. Acta. Odontol. Scand. Vol. 39: 241-249.

"Although the predominant beneficial effect of fluoride occurs locally in the mouth, the adverse effect, dental fluorosis, occurs by the systemic route." - Formon, SJ; Ekstrand, J; Ziegler, E. (2000). *Fluoride Intake and Prevalence of Dental Fluorosis: Trends in Fluoride Intake with Special Attention to Infants*. J Public Health Dent 60(3):131-9.

Fluoride Supplements:

"[T]he evidence in support of the effectiveness of fluoride supplements is poor." - Riordan P J. (1999) *Fluoride supplements for young children: an analysis of the literature focusing on benefits and risks*. Community Dentistry and Oral Epidemiology: Vol 27; 72-83, 1999.

"There does not seem to be scientific evidence to support the widespread use of fluoride supplements by young children, even in the absence of fluoride in water:" - Burt, BA. (1994). *The Case for Eliminating the Use of Dietary Fluoride Supplements Among Young Children*. Abstract of paper presented at Dietary Supplement Conference, American Dental Association, Chicago, Illinois, January 31 - February 1.

"The basis for the widespread acceptance of fluoride supplements in caries prevention is a large number of mostly small clinical trials in the late 1950's and 1960's. The early studies have been reviewed again recently in a series of publications and they have again been criticised (8, 13-15). The criticisms are serious and virtually none of the early fluoride supplement studies would be published today, because of methodological and other shortcomings. They present conclusions that are not supported by their data or consistent with their designs." - Riordan P J. (1999) *Fluoride supplements for young children: an analysis of the literature focusing on benefits and risks*. Community Dentistry and Oral Epidemiology: Vol 27; 72-83, 1999.

"The risks of using fluoride supplements outweigh the benefit. Since there are alternative forms of fluoride to use in high risk individuals, fluoride supplements should no longer be used for young children in North America." - Burt, BA. (1994). *The Case for Eliminating the Use of Dietary Fluoride Supplements Among Young Children*. Abstract of paper presented at Dietary Supplement Conference, American Dental Association, Chicago, Illinois, January 31 - February 1.

"After filing a FOIA and waiting six months, I was stunned when I was advised by the FDA that fluoride supplements were not approved by the FDA. Incredibly, in fifty years, no one has ever bothered submitting a petition to the FDA to have these products approved!" - NJ Assemblyman John Kelly. (2000). *Letter to Senator Robert Smith, Chairman, Environment and Public Works Committee*. August 14. <http://fluoridealert.org/fda.htm>

The Pit & Fissure Factor:

"Let me begin by saying that fluorides are most effective in preventing decay on the smooth surfaces of teeth. However, the chewing surfaces of posterior [teeth] are not smooth. They have crevices and pits and it is our experience that fluorides don't really get access to these pitted areas." - Dr. Harald Loe, Director of the National Institute of Dental Research. (March 1984). *Hearings: Subcommittee of the Committee on Appropriations, House of Representatives*.

"It is estimated that 84% of the caries experience in the 5 to 17 year-old population involves tooth surfaces with pits and fissures. Although fluorides cannot be expected appreciably to reduce our incidence of caries on these surfaces, sealants can." - Journal of the American Dental Association. Editorial: Preserving the perfect tooth. Vol. 108.

"[E]namel surfaces with pits and fissures receive minimal caries protection from either systemic or topical fluoride agents." - Pinkham, JR, (Head of Pediatric Dentistry, U of Iowa College of Dentistry) Senior Editor. (1999). *Pediatric Dentistry Infancy Through Adolescence, Third Edition*. WB Saunders Co.

"The type of caries now seen in British Columbia's children of 13 years of age, is mostly the pit and fissure type. Knudsen in 1940, suggested that 70 percent of the caries in children was in pits and fissures. Recent reports indicate that today, 83 percent of all caries in North American children is of this type. Pit and fissure cavities aren't considered to be preventable by fluorides, they are prevented by sealants." - Gray, AS. (1987). *Fluoridation: Time for a New Base Line?* Journal of the Canadian Dental Association. 10: 763-765.

"Fluoridation and the use of other fluorides have been successful in decreasing the prevalence of dental caries on the smooth surfaces of teeth. Unfortunately, these efforts have much less effect on dental caries that occur in the pits and fissures of teeth (particularly on the biting surfaces of teeth) where more than 85 percent of dental caries now occur." - Public Health Reports. (1993). *Toward Improving the Oral Health of Americans*. Vol. 108, No. 6. Nov. - Dec.

"The program focused on four caries-prevention techniques: sealants, a plastic-like coating applied to the chewing surfaces of back teeth and to pits and fissures on the sides of teeth (these surfaces are most prone to decay and ones which fluorides cannot protect adequately)." - Science News. (Jan 7, 1984). Dental study upsets the accepted wisdom. Vol. 125, No. 1.

UNICEF on Fluoride:

"It has long been known that excessive fluoride intake carries serious toxic effects. But scientists are now debating whether fluoride confers any benefit at all." *Fluoride in Water: An Overview*. See: www.unicef.org/programme/wes/info/fluor.htm

"Fluoride was first used to fight dental cavities in the 1940s, its effectiveness defended on two grounds:

"Fluoride inhibits enzymes that breed acid-producing oral bacteria whose acid eats away tooth enamel. **This observation is valid, but some scientists now believe that the harmful impact of fluoride on other useful enzymes far outweighs the beneficial effect on caries prevention.**"

"Fluoride ions bind with calcium ions, strengthening tooth enamel as it forms in children. **Many researchers now consider this more of an assumption than fact, because of conflicting evidence from studies in India and several other countries over the past 10 to 15 years.** Nevertheless, agreement is universal that excessive fluoride intake leads to loss of calcium from the tooth matrix, aggravating cavity formation throughout life rather than remedying it, and so causing dental fluorosis." - UNICEF. *Fluoride in Water: An Overview*. See: www.unicef.org/programme/wes/info/fluor.htm

Dental Fluorosis

"[S]tudies published in the 1980's and 1990's have shown that **dental fluorosis has increased dramatically in North America...A lifetime of excessive fluoride ingestion will undoubtedly have detrimental effects on a number of biological systems in the body and it is illogical to assume that tooth enamel is the only tissue affected by low daily doses of fluoride ingestion.**" - Dr. Hardy Limeback, Head, Preventive Dentistry, University of Toronto. (2000). *Why I am now Officially Opposed to Adding Fluoride to Drinking Water*. Open Letter.

"The public is generally not aware of dental fluorosis. This is changing; there have been attempts at litigation in several countries. Cosmetic issues related to teeth matter, witness the increasing proportion of dentists' time devoted to aesthetic care and the many articles in clinical journals about techniques to improve the appearance of moderate and severe fluorosis. It is only a matter of time until a case is brought that gets public attention. **The risk is that noticeable fluorosis will be perceived by the public as a toxic consequence of fluoride ingestion - which, arguably, it is (57).**" - Riordan P.J. (1999) *Fluoride supplements for young children: an analysis of the literature focusing on benefits and risks*. *Community Dentistry and Oral Epidemiology*: Vol 27; 72-83, 1999.

"**Common sense should tell us that if a poison circulating in a child's body can damage the tooth-forming cells, then other harm also is likely.**" - Colquhoun, J. (1997). *Why I Changed My Mind About Water Fluoridation*. *Perspectives in Biology and Medicine* 41:29-44. <http://www.fluoride-journal.com/98-31-2/312103.htm>

"**With this widespread exposure to fluoride, it is hardly surprising that the prevalence of dental fluorosis is today much higher than it was 50 years ago.** Most of this increase has been in the mildest forms of fluorosis, which are of questionable importance as a public health issue. But the trend toward a rising prevalence of fluorosis has been fairly consistent over recent years, and the extent of the moderate-severe categories, while still only a small fraction of overall prevalence, has increased." - Burt, BA. (1995). *Introduction to Symposium*. *Journal of Public Health Dentistry*. Vol 55. No. 5.

"**Current studies support the view that dental fluorosis has increased in both fluoridated and non-fluoridated communities. North American studies suggest rates of 20 to 75% in the former and 12 to 45% in the latter.** Although largely confined to the "very mild" and "mild" categories of the condition, they are of concern insofar as they are discernable to the lay population and may impact on those so affected...Research is needed into the relative effects of dental decay and fluorosis on quality of life outcomes and community values regarding the balance between reductions in dental decay and increases in dental fluorosis associated with water fluoridation." - Locker, D. (1999). *Benefits and Risks of Water Fluoridation. An Update of the 1996 Federal-Provincial Sub-committee Report*. Prepared for Ontario Ministry of Health and Long Term Care.

"**The prevalence of fluorosis at a water fluoride level of 1.0 ppm was estimated to be 48% and for fluorosis of aesthetic concern it was predicted to be 12.5%.**" - McDonagh, M. et al. (2000). *A Systematic Review of Public Water Fluoridation*. NHS Center for Reviews and Dissemination, University of York.

"**When I first saw that my teeth were discolored, I was teased quite a lot, especially in the middle school by people. They used to say, 'oh you don't clean your teeth or anything' and they used to call me 'shit teeth' which did upset me, even though I knew it was fluorosis.**" - Amanda Mathews, child with dental fluorosis. (1997). *Don't Swallow Your Toothpaste*. Health Alert. Channel 4. UK. <http://www.fluoridealert.org/dsyt.htm>