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Is the fluoridation of public water supplies 'Shaping a healthier future'?: a project submitted in partial fulfilment of requirements for the Diploma in Management Law of the Dublin Institute of Technology, Aungier Street.

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Is the fluoridation of public water supplies 'Shaping a healthier future'?

By

Josephine Doyle

Diploma in Management Law (B. Sc. MGMT.) 1998

Abstract

Title: Is the fluoridaton of Public Water Supplies 'Shaping a healthier future..."?

Author: Josephine Doyle

The Health (Fluoridation of Water Supplies) Act, 1960 , was passed by the Irish Legislature in December, 1960. It provides for the mandatory fluoridation of public piped water supplies in order to reduce the incidence of dental caries. The purpose of this project is to examine the Act against the Department of Health and Children's Health Strategy, 'Shaping a healthier future, A strategy for effective healthcare in the 1990s' which was launched in 1994 to see if the Act satisfies the strategy and the Strategic Management Initiative (SMI). and if it is still an effective piece of legislation as we approach the twenty-first century.

'Shaping a healthier future' sets out three key principles which underpin the entire strategy: equity, quality of service and accountability. In this project I propose to examine the 1960 Act to see if, and how it satisfies each of these three principles. The controls that are in place to ensure that the programme operates in an efficient and effective manner will be examined.

I will conclude that the Act has withstood the passage of time, that measures are in place to satisfy the principles of the Health Strategy and the central aim of SMI - the delivery of quality services to the public. If adequate funds are provided and strict monitoring is adhered to the fluoridation of public water supplies should continue well into the twenty-first Century.

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A project submitted in partial fulfilment of
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April 1998

This is an original work.

All references and assistance are acknowledged.

Josephine Doyle

April , 1998

Preface and Acknowledgements

I would like to express a very special thank you to Dr. Gerard Gavin, Chief Dental Officer, Department of Health and Children for his ideas and assistance with this project. To Mr. John Anderson, Department of the Environment and Local Government for his very helpful information. A special thank you also to Mr. Tom Coleman and all my colleagues in Community Health Division, Department of Health and Children, for their help, patience, advice and support throughout this project. To my family and friends for their patience and support over the past year. And, finally a very sincere thank you to my tutor, Mr. Chris Nutty, for his guidance, support and re-assurance throughout this project.

J.D.

This project is a lay person's examination of the processes involved in the management of fluoridated public water supplies in Ireland and does not purport to be a clinical or technical assessment of the programme.

CONTENTS

INTRODUCTION

The Health (Fluoridation of Water Supplies) Act was passed into the Irish Statute books in December 1960. The Act provided for the mandatory fluoridation of public piped water supplies throughout Ireland. The aim of the programme being to improve dental health and protect against dental decay. Fluoridation is achieved through the addition to the water supply of hydrofluosilicic acid.

In 1994, thirty-four years later, the Department of Health (now Department of Health & Children) published its health strategy *"Shaping a healthier future - A strategy for effective healthcare in the 1990s"*[1]. This strategy put forward a vision for the future development of the health services in Ireland to achieve both health and social gain. The strategy statement is underpinned by three key principles: equity, quality of service and accountability. In this project I propose to evaluate the water fluoridation programme to see if it is still relevant in the 1990s and if it satisfies those three key principles of the Health Strategy.

I will, therefore, in Chapter One examine the background to fluoridation; its early history, its introduction to Ireland, the passing of the Act through the Houses of the Oireachtas and the subsequent Constitutional challenge to the Act. I will also look at the Health Strategy and the Strategic Management Initiative.

In Chapter Two I will look at the **principle of equity** . I will examine the meaning of equity as defined in the Health Strategy. I will also look at the Ottawa Charter for Health Promotion and WHO's targets for Health for All by the year 2000. I propose to examine

[1] Department of Health 1994

equity in relation to the water fluoridation programme to see if it is an equitable system or does it discriminate against certain groups or classes of persons. I will also look at the safety aspects and the undesirable side effects of fluoride such as dental fluorosis. I will also look at the population now covered by water fluoridation in Ireland and the alternatives which are available.

In Chapter Three I will examine the **principle of Quality of Service** which means that the services must meet the highest possible quality standards within the resources available. In this regard I will refer to the World Health Organisation's recommendations for an effective treatment programme. In relation to the technical quality of the service, I will examine the leglisative framework (the Act and Regulations) for the addition of the chemical to the water and the monitoring arrangements for efficient operation and the maintenance of quality standards. Who has responsibily for the Programme and what is the role of the various bodies, for example the health boards and the sanitary authorities? What processes are involved in the purchase of the fluoride. Does the Scheme meet the highest possible quality standards within the resources available? This will require an examination of the monitoring returns which are submitted quarterly to the Department to see if they produce satisfactory results. I propose also to look at how the programme is funded. What is the age and condition of the equipment and how much capital is provided annually for the programme?

In Chapter Four I will examine the **principle of Accountability.** The Health Strategy was accompanied by a four year action plan for the development of health services. In relation to Dental Services, the Dental Health Action Plan set specify targets, inter alia, to increase efficiency of water fluoridation schemes, continuing upgrading of existing water fluoridation plants and appropriate increases in the number of water fluoridation plants. The plan also set oral health goals that it aims to achieve by the year 2000. It will be necessary to see if these are being met. Applying the principle to the fluoridation programme I propose to look at the objectives which have been achieved by studying the various oral health surveys which have been carried out either nationally or by individual health boards. I will also briefly look at other developments since the introduction of the Strategy. The Co-ordinating Group of Secretaries second report on SMI and some of the various Acts which have been introduced since the Strategy which will influence the fluoridation programme.

Finally, in Chapter Five I will make my conclusions and recommendations. I will identify the additional requirements that strategic management, has placed on the water fluoridation programme; to show the need for careful monitoring of the Scheme; that an examination of the data available will show a reduction in the number of caries as a result of water fluoridation; Overall I propose to show that the fluoridation of water supplies is still the most effective method of reducing the incidence of dental caries in children and that the programme is an equitable and cost effective method of providing oral health care.

Chapter One

Background, Introduction to Ireland and the Health Strategy

Early History

As far as may be ascertained Ehrhardt[2] in 1874 in Germany was first to suggest a relationship between teeth and fluorides. Magitot[3], in France in 1878 found that dental enamel was more resistant to organic acids than were the other calcified tissues and he attributed this to its fluoride content. Crichton-Browne [4](1892) suggested a possible connection between fluorides in the diet and a decreased incidence of dental caries.

Eager [5](1901) while working in a hospital in Naples described the condition which is now known as endemic dental fluorosis. He associated this with the contamination of drinking water in the neighbourhood of Vesuvius by volcanic action. Following a change in the source of water supply in one part of the Naples area Eager reported that the prevalence of affected teeth among children born there subsequently was greatly reduced. Also in 1901, Frederich McKay[6], when he began practising dentistry in Colorado Springs, noted a lot of the local people had a permanent stain on their teeth. He named it 'Mottled Enamel' and carried out a series of investigations culminating in a comprehensive report which he published in 1916. He identified other communities which exhibited the stain and noted a definite geographical distribution, often associated with a deep well water supply. He concluded that some unidentified constituent of the water was responsible. Further studies by McKay (1925 to 1933) concluded that by changing water supplies from deep

2 Ehrhardt, J Monatsh, rat. Aerzte 19, 359 (1874)
3 Magitot, E. (1878) trans. Chandler, T.H. Treatise on Dental Caries, Osgood and Co. Cambridge, Mass
4 Crichton-Browne, J. Lanclet, 2.6. (1892)
5 Eager, J. M. (1901) Publ. Hlth. Rep. (Wash) 16, 2576
6 McKay

wells to shallow supplies no new fluorosis developed subsequently. Other investigators[7] identified fluoride in the domestic water supplies as the common characteristic in the areas of endemic dental enamel mottling.

In 1925[8] it was found that the dentition of experimental animals was improved by increasing the amount of fluoride in their diet.

The identification of fluoride as the causative element of the mottling led to a drive to eliminate it from food and drink, especially water throughout the United States. At this time Dean[9] developed a quantitative index which was related both to the severity of fluorosis and to the level of fluoride in the water. As a result the maximum permissible concentration of fluoride in drinking water which would not result in noticeable enamel fluorosis was determined to be about one part per million. (ppm)[10]

It was not recognised at the time that this particular level of 1 p.p.m.F was the optimal one for dental caries prevention, nor that mottled-enamel was less caries-prone. Surveys carried out in the period 1933 - 1942[11] in the United States showed that waters containing concentrations of from one to eight and even 10.0 p.p.m. F. had for long been in use for domestic and industrial purposes. Dean examined 7,257 school children aged 12 - 14 years in twenty-one cities in United States and found that a 50% to 65% reduction

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7 Churchhill H.V (1931), Industr. Eng. Chem. 23, 996 and Smith, M.C. Lantz, EM, and Smith H.V. (1931) Techn. Bull. No. 32 Univ. Ariz. Coll. Agr.

8 McCollum, E. V. Simmonds, N. Becker, J. E. and Bunting, R. W. J. Biol. Chem. 63, 553 (1925)

9 Dean 1937

10 Dean and Elvove, 1937

11 Dean HT , Jay P, Arnold F A. Jr., McClure, FJ and Elvove E., Pub. Health Rept 54, 862 (1939) and Dean HT, Arnold F A. Jr., McClure, FJ and Elvove E., Pub. Health Rept. 57, 1155(1942)

in the incidence of dental caries in school-children might be expected where concentrations of fluorine of between 1.0 and 1.5 p.p.m. were present in water supplies.

In Britain, Weaver[12] in 1944 also found that the incidence of caries in both the deciduous and the permanent teeth in children where the water supply contained 1.2 -1.8 p.p.m. of naturally occurring fluorine was about 50% less than children where the water supply only contained 0.25 p.p.m. F.

Addition of fluorides to Water Supplies

The first large scale experiment on the addition of fluoride to public water supplies began in United States and Canada in 1945 and 1946[13]. In these studies two neighbouring towns with fluorine free water supplies were chosen, preferable with the water drawn from the same source. One supply was fluoridated while the other was left untreated. After about 6 years of fluoridation the caries experience of children born and permanently resident in the selected cities began to show significant reductions.[14] After ten years the reduction in both permanent and deciduous teeth was approximately the same as that found in communities having a natural fluoride level of about 1 p.p.m. F. This reduction was equally evident after fifteen years.

First Steps to the introduction of fluoridation into Ireland

National Nutrition Survey

In 1944, Dr. Con Ward, Parliamentary Secretary to the Minister for Public Health, Mr. Sean MacEntee, advised that a National Nutrition Survey should be carried out in Ireland.

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12 Weaver

13 Grand Rapids, Michigan in January 1945 Newburgh, New York and Brentford Ontario.

14 Arnold et al (1956) Publ. Hlth. Rep (Wash.) 71 657 and 1962 J. Amer. Dent. Ass. 65, 780

It was felt that nutrition and diet had a bearing on, inter alia, dental caries incidence and prevalence.[15]

The Nutrition Survey initiated in 1946 with the Medical Research Council was extensive and exhaustive. Seven separate surveys and reports were undertaken, the whole being completed by a clinical survey the report of which was presented to Dr. James Ryan, the then Minister for Health in 1952.[16] The nutrition survey revealed differences in the levels of food intake between the various areas investigated and differences in dietary habits. Works at that time[17 18] had drawn attention to the relationship between dental caries experience and dietary intake by Channel Island children during the war and occupation.

Dental Caries Survey

A few months after receiving the report on the nutrition survey, Dr. Ryan requested the Medical Research Council of Ireland in 1952 to carry out a survey:

> *'to ascertain whether there were significant differences in dental condition amongst schoolchildren living in different areas of the country and whether such differences, if they existed, could be related to differences in the dietary intake of the children.'*[19]

The National Nutrition Survey provided the basis for this investigation. The results of the survey, which was carried out on approximately 2000 school-children under the auspices of the National Nutrition Committee of the Medical Research Council, showed that:- 1. Dental caries experience among school-children was uniformly high throughout the survey areas.

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15 Water Fluoridation and Dental Caries in Ireland: Background Introduction and Development, S O'Hickey, J Irish Dent Assoc. (1976) **22**; 61-66

16 Fluoridation in Ireland: The Spadework, S MacEntee J Irish Dental Assoc. (1972) **18**; 48

17 Knowles EM (1946) Monthly Bull. Ministry of Health (Aug) 162

18 Bransby, ER and Knowles EM (1949) Brit. Dent. J. **87** 236

19 Medical Research Council (1952)

2. The prevalence and severity of the condition were independent of the environment, domestic circumstances and domestic habits of the children concerned.[20]

Drum[21] had earlier carried out an investigation sponsored by the Medical Research Council of Ireland into the composition of Irish drinking waters, with special references to the distribution and significance of fluoride. His studies of some 42 waters showed that only 10 contained fluoride. Concentrations in these ranged from 0.1 to 0.3 p.p.m. F.

The Fluorine Consultative Council

The Fluorine Consultative Council was appointed by the then Minister for Health, Mr. T. F. O'Higgins T. D. in January 1957 with the following terms of reference:-

> *'Whether with a view to reducing the incidence of dental caries it is desirable to provide for an increased intake of fluorine, and, if the Council considers it so desirable, to advise as to the best method of securing such an increased intake, and as to any safeguards and precautions necessary.'*[22]

The Council was chaired by a medical inspector from the Department of Health and consisted of an additional 17 members - 5 dentists, 3 doctors, 2 engineers, 2 senior administrators, a veterinary surgeon, a geologist, a pharmaceutical chemist, a Senator (also Chair of a County Council) and a research chemist.

The Council considered all aspects of fluoridation. It reviewed the historical background, examined the studies which had been published on dental effects of fluoridated water supplies, possible ill-effects of increased fluoride intake, the engineering aspects of

20 O'Hickey, S op.cit. 63.
21 Drum, J.A., Scientific Proceedings of the Royal Dublin Society 25 July, 1949
22 Report of the Fluorine Consultative Council, May 1958 - Stationary Office, Dublin

fluoridation of water supplies, projected costs, alternative methods of increasing fluorine intake and the ethical aspects of fluoridation.

The recommendations, with the exception of the ethical aspects of fluoridation, were unanimously agreed. In May 1958 the Consultative Council unanimously advised that:

> *"Having considered all the information available to it on the relationship between fluorine and dental decay the Council is satisfied that an increased intake of fluorine will reduce the incidence of dental caries and that it is desirable to provide for such an increased intake. The Council is further satisfied that the increased intake of fluorine can best be provided by the fluoridation of public water supplies to the level of 1.0 parts per million F.*[23]

The Council further recommended that before any supply is fluoridated the Council should assess the incidence of dental caries in children resident in the area served by that water supply, and subsequent to fluoridation the results should be properly evaluated. It recommended the introduction of enabling legislation.

The Health (Fluoridation of Water Supplies Act) 1960

The Minster presented the Report of the Fluorine Consultative Council to the Oireachtas in October, 1959. By December 1958 the Minister for Health had decided that it was necessary to make the provisions of the Fluoridation Bill mandatory and not discretionary because (a) there was no significant difference in the incidence of dental caries over the whole State, thus the need to treat all waters for fluorine deficiency was uniform throughout the State; (b) if the issue was left to the several health authorities to decide, members of those authorities would have to familiarise themselves with all the dental and medical surveys, and if they were not familiar with them there were likely to be misled by

[23] ibid. 15

the anti-fluoridationists; and (c) there were more than 80 separate water authorities, several of which were partners in drawing water from a common source. It would be a chaotic situation if some elected to fluoridate and some rejected it.[24]

In the subsequent debates on the Health (Fluoridation of Water Supplies) Bill the question of whether fluoridation should be compulsory or voluntary became the sole real issue between the main Opposition and the Government. Many highly motivating and sensational claims including that fluoride was poison and dangerous to health were made.

The Bill was passed by Dail Eireann and the Seanad and signed by the President on 28 December, 1960. However it was a further three and a half years before the first water supplies were fluoridated because of a constitutional challenge taken by a Dublin housewife.

Constitutional Challenge

The Irish Constitution of 1937 provided that the National Parliament was not to pass any law which was repugnant to any of its clauses, and if it did the statute was to that extent invalid. The High Court was given jurisdiction to decide whether a law was invalid and its decision could be brought to the Supreme Court.

On notice being given of the intention to fluoridate public water in the areas supplied by Dublin water authorities legal proceedings were instituted by Mrs. Ryan, a Dublin

[24] MacEntee S - Fluoridation in Ireland, The Spadework, J. Ir. Dent. Assoc. (1972) 18; 51

housewife who challenged the Constitutional validity of the Act of 1960. She claimed that the Act of 1960 was invalid because

> '*(1) it is a violation of the inalienable and imprescriptible rights guaranteed to the Family by Article 41 of the Constitution,*
>
> *(2) it is a violation of the inalienable right and duty of parents to provide, according to their means, for the religious, moral, intellectual, physical and social education of their children given by Article 42 of the Constitution and*
>
> *(3) it is a breach of the guarantee in Article 40 section 3 of the Constitution by the State "in it its laws to respect, and as far as practicable, by its laws to defend and vindicate the personal rights of the citizen."*[25]

In relation to (3) above the plaintiff claimed that Article 40. 3 gave her a right to bodily integrity and the Oireachtas in passing the Act had not respected that right, that the fluoridation of water supplies is or may be dangerous to the health of all or some of the citizens and, therefore, that in passing the Act of 1960 the Oireachtas had failed to respect and, as far as practicable, by its laws to defend and vindicate that right.

The action which was before Mr. Justice Kenny in the High Court for 65 days is very important in that from a legal viewpoint, it decided fundamental issues on the meaning and extent of the guarantee by the State to defend and vindicate personal rights. It determined that citizens have rights protected by the Constitution which are not expressly enumerated, and one of the unenumerated rights protected by Article 40.3 was the right to bodily integrity. It was also the first occasion in Ireland when the desirability and safety of a public health measure had to be considered by the courts.

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[25] Judgement of Kenny J, High Court 1963 - Dept. of Health, Stationary Office,Dublin

From a health viewpoint, the case also involved an extensive examination of several scientific publications and surveys and intense examination and cross-examination of expert witnesses.

The first argument against the Act, that it was *a violation of Article 41 of the Constitution by which the State guarantees to protect the family in its authority*, failed in the High Court on the grounds that when the Constitution was passed there were many Acts in force which regulated the quality of food and drink, and so, if fluoridation was beneficial, it could not be an infringement of parental authority. The Supreme Court subsequently decided that there is nothing in the Constitution which recognises the right of a parent to refuse to allow the provision of measures for the good health of the child when these are not harmful.

On the second argument, that *the Act infringed the right of the parents to educate their children*, Counsel for the plaintiff argued that education included rearing and nurturing and that altering water in its natural State was an interference with this right. The word 'education' had this meaning two hundred years previously but was no longer in most dictionaries. The Court decided that this definition was no longer in use and the education referred to was of a scholastic type.

The main argument, that *the personal rights of the citizen had been infringed because these included a right to bodily integrity*, concluded that fluoridation is the only practicable way of dealing with dental caries and it does not involve any risk to the health of anyone, young or old. While it increases the concentration of the fluoride ion in the skeletal frame and produces some mild mottling of the teeth neither of these is harmful or a risk to health.

Kenny J held that the fluoridation of public water supplies is not a violation of any of the plaintiff's constitutional rights and dismissed the action. The decision was upheld in a subsequent appeal to the Supreme Court. The final decision was delivered in July 1964 and almost immediately the physical process of fluoridation went into operation.

Strategic Management and the Health Strategy

Richard Boyle[26] describes 1994 as "a watershed in the evolution of the public service". The year started with the then Taoiseach Albert Reynolds, T.D. inviting the Ministers and Secretaries of Government Departments to a lunch where he announced his determination to give the public service a whole new strategic focus. He outlined a strategic management initiative (SMI) whereby each government department must put in place a process of strategic management. By the end of that year controversies such as the report of the beef tribunal, Galmoy mine and the Attorney-General's Office handling of the Fr. Brendan Smyth's extradition raised issues such as the relationship between senior civil servants and ministers. SMI promotes the introduction of strategic management processes into government departments and expects departments to investigate their organisational structures and procedures in the light of a strategic review and analysis.

The policy agreement '*A Government of Renewal*' between Fine Gael, the Labour Party and Democratic Left which formed the basis for the government appointed in December 1994 also referred to the need for change

26 Boyle Richard - Towards A New Public Service, I.P.A. (1995) 2

'...the reform of our institutions at national and local level to provide service, accountability, transparency and freedom of information' [27]

This policy agreement also indicated the need for continuing change and proposed to reform the ***Ministers & Secretaries Act, 1924*** to allow for the exercise of delegated power and responsibility.

1994 was also the year when the Department of Health published its health strategy ***'Shaping a healthier future - A strategy for effective health care in the 1990s*** (the Health Strategy). The main theme of the Strategy is the reorientation of the system towards improving the effectiveness of the health and personal social services by reshaping the way that services are planned and delivered. There are three dimensions. These are:

1) The Services - prevention treatment and care services will be more clearly focused on improvements in health status and the quality of life, and will place an increased emphasis on the provision of the most appropriate care.

2) The Framework - management and organisational structures to provide for more decision making and accountability at regional level allied to better methods of performance measurement and

3) The Participants - greater sensitivity to the right of the consumer to a service which responds to his/her needs in an equitable and quality-driven manner; and greater recognition will be given to the key role of those who provide the services and the importance of enabling them to do so to their full potential. [28]

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27 A Government of Renewal - a policy agreement between Fine Gael, the Labour Party and Democratic Left, Dublin: Stationery Office, 1994

28 Shaping a healthier future - A strategy for effective healthcare in the 1990s, Stationery Office Dublin (1994) 44

The publication of the Health Strategy in 1994 was the culmination of a reappraisal of the health services in a wider context which had commenced in 1986 with ***Health -the Wider Dimensions*** [29] - a review of the twin challenges for those responsible for the direction and management of the services - the challenge of achieving the health targets under Health for All, the World Health Organisation initiative launched in 1984 and the challenge of managing services with fixed or reducing resources.

Shaping a healthier future broke with both the content and style of previous major policy statements and set more concrete and ambitious targets for the system as a whole.[30]

The 1994 strategy has been complemented in 1997 by the first ***Statement of Strategy for the Department of Health***[31] and its ***Customer Service Action Plan 1998-1999.***[32] The Department has also recently presented its ***Statement of Strategy 1998 -2001*** to the Minster in compliance with Section 4(1)(b)(i) and (ii) of the ***Public Service Management Act, 1997.*** The Department is now geared to maintain strategic focus, to know better what is and is not working and to work in partnership with all the main providers. It must strive continuously for health and social gain using available resources in an optimum manner.

The underpinning principles of the 1994 Health Strategy are **equity, quality of services and accountability**. The strategy is accompanied by a four year action plan for certain services which maps out the detail of what will be achieved. Its development has also

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29 Dept. of Health (1986)

30 Strategic Planning in the Irish Health Services, O'Dwyer J an essay from Reflections on Health - Commemorating 50 years of the Dept. of Health 1947 -1997 Dept. of Health (1997), 251

31 Dept. of Health 1997

32 Dept. of Health 1997

taken account of the themes and targets of the World Health Organisation's "***Health for All***" programme. The Strategy for Dental Services is outlined in the ***Dental Health Action Plan***. Its three key aims are to 1) reduce the level of dental disease in children, 2) improve the level of oral health in the population and 3) provide adequate treatment services to children and to medical card holders. The Action plan adopted Oral Health Goals for the year 2000 which are discussed further in Chapter Four. The Plan also provides for closer monitoring of fluoridation plants, continual upgrading of existing plants and relatively small increases in the number of new plants. During the course of the plan where necessary the efficiency of water fluoridation schemes will be increased by upgrading existing plants where necessary and merging inefficient smaller plants into larger regional schemes.

Chapter Two

Equity

The word 'equity' is defined as '*the quality of being impartial, fairness;* '[33] **'Delivering better Government'** in its vision for the Civil Service states that *'the Civil Service operates necessary and simplified regulations efficiently and fairly'.* The **'Programme for Competitiveness and Work'**[34] promised '*the development of social services which secure greater social equity and protect the position of those who are most vulnerable in our society*. It stated that special emphasis will be placed on positive health measures to address serious community health problems.

Equity in Health

The Health Strategy in relation to Equity states that *'the achievement of an equitable health service has a number of dimensions. Access to health service should be determined by actual need for services rather than ability to pay or geographic location.'* Furthermore, it states that '*the pursuit of equity must extend beyond the question of access to treatment and care, and must examine variations in the health status of different groups in society and how these might be addressed. Achieving equity in the healthcare system will involve not only ensuring fairness, but also being seen to be fair.*'[35] The Strategy then goes on to specify important steps to ensure greater equity including implementing uniform rules for eligibility and charges for services across the country and giving special attention to certain disadvantaged groups.

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33 Collins Concise Dictionary (1990); 419
34 pages 61- 65
35 Shaping a healthier future... pg 10

The Ottawa Charter for Health Promotion

The first International Conference on Health Promotion meeting in Ottawa in November, 1986 presented a Charter for action to achieve Health for All by the year 2000 and beyond. It describes health promotion as '*the process of enabling people to increase control over, and to improve, their health.*' It should focus on achieving equity in health and promotion action aimed at reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. This includes a secure foundation in a supportive environment, access to information, life skills, and opportunities for making healthy choices and to be able to take control of the things which determine one's health. It suggests that this can be achieved by having a secure foundation in a supportive environment, access to information, life skills and opportunities for making healthy choices.

World Health Organisation - Targets for Health for All by the year 2000

There are 38 targets in support of the European Regional Strategy addressing the improvements in health status expected by the year 2000.[36] The health outcomes should, inter alia, ensure equity in health by reducing disparities in health status between countries and between groups within countries and adding health to life by reducing disease and disability. One of the major themes running throughout the health targets is that equity is the essence of health for all. All people should have a fair opportunity to realise their full health potential. The targets also recognise the prevention of disease and promotion of health as important strategic issues to give people a positive sense of health so that they can make full use of their physical, mental and social capacities.

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[36] World Health Organisation, Regional Office for Europe, Copenhagen, 1985

The first target 'Equity in Health' targets the reduction in the differences in health status between countries and groups within countries by at least 25% by improving the level of health of disadvantaged nations and groups. It suggests that this can be achieved in a number of ways, including strengthening of monitoring of differences in health status between different geographical areas and socio-economic groups within each country with priority being given to implementation of measures to reduce differences in health status. The basic prerequisites for health should be available to all, and living and working environments that support health should be more accessible. Another target deals with reducing chronic disease and includes dental caries as such a disease. It specifies that this target may be achieved through 'a reduction in severity of dental caries and periodontal disease to the point where children have no more than two decayed, missing or filled teeth by the age of 12 years.

Equity and Water Fluoridation

How appropriate is it to refer the principle of equity to a preventative measure such as fluoridation of public water supplies? Mr. Brendan Howlin, T.D. as the Minister for Health launching the Health Strategy, stated that 'the principle of equity ensures '*that our health services should help first and foremost those people whose needs are greatest.*'[37]

The then Minister for Health, Mr. S. MacEntee during the debate on the Bill in 1960 in Dail Eireann referred to dental caries as *'a disease which not only causes suffering, but also, because of the damage which it does, may lead to grave disorders and prolonged ill-health.*'[38] He also stated that *'it is one of the most prevalent and widespread disabling*

[37] Shaping a healthier future... Dept. Health, Dublin 1994, 3

[38] Parliamentary Report, Dail Eireann, pg1743-1745 5, April, 1960

diseases in the world and is not restricted to any specific, age, sex or economic status...It is a disease for which so far no effective and complete cure has been found.'

Kenny J in his judgement in the Ryan case [39]also referred to the incidence of dental caries and how the evidence heard during the case established beyond doubt that dental caries in children is a pressing problem and that its prevalence is likely to increase. It is a disease which will have an ever-increasing bad effect on the health of the members of the community unless it is checked. He referred to the 1958 WHO report[40] which concluded that dental disease is one of the most widespread and prevalent diseases of which there is no hope of controlling by present treatment methods alone.

Ethical Aspects of Fluoridation

The Fluorine Consultative Council stated in its report that it had received representations to the effect that fluoridation of public water supplies was unethical.[41] The main grounds of the objections were that it was '*mass medication, a usurpation of parental rights by the public authorites and an interference by the public authority with the integrity of the human body*. The Council was satisfied that there is no ethical objection to the fluoridation of public water supplies within the margin of safety recommended in the report, i.e 1.0 part per million F.

During the Dail Debates on the Fluoridation Bill there were some horrific anti-fluoridation claims put forward. However, Kenny J in the early part of his judgement, in stating the principal features of the Act of 1960, stated that although the Act placed an obligation on authorities to put fluorine into the piped water supplies

39 Fluoridation Judgement Kenny J, High Court pg 12
40 Expert Committee on Water Fluoridation, World Health Organisation 1958
41 pg 14 Report of Fluorine Consultative Council, May 1958, Stationery Office,Dublin

reaching the public it did not impose an obligation on anyone to drink or use the water which has been fluoridated, nor did it make it unlawful to extract fluorine out of the water coming to homes. However, the opinion of the Supreme Court on this issue was that it would be wholly unrealistic to say to a citizen of a city the size of Dublin that he can avail of alternative supplies and the suggestion that the fluoride ion can be easily extracted from the water required a fuller examination than that given. [42]

The World Health Organisation[43] states that laboratory research suggests that fluoride is most effective in caries prevention when a low level of fluorine is constantly maintained in the oral cavity. It states that the goal of community-based public health programmes, should be to implement the most appropriate means of maintaining a constant low level of fluoride in as many mouths as possible. The report states that provided that a community has a piped water supply, water fluoridation is the most effective method of reaching the whole population, so that all social classes benefit without the need for active participation on the part of individuals.[44]

SAFETY ASPECTS

Section 2(3) of the Health (Fluoridation of Water Supplies) Act 1960 provides for, the making of regulations as to the manner in which, and the extent to which, health authorities shall perform their functions under the Act and specifies the amount of fluoride which may be added. Subsequent regulations specify the parameters which must be met and provide for certain tests to be carried out to ensure that the fluoride levels meet these parameters. Results of these tests will be examined in Chapter Three.

42 Fluoridation, Judgement of the Supreme Court of Ireland, 3rd July, 1964, Dept. of Health Dublin.
43 Fluorides and oral Health WHO Technical Report Series 846 (1994) 1
44 ibid.16

Undesireable side-effects of fluoride

Dental Fluorosis

The WHO report referred to above, states that experience has shown that it is not possible to achieve effective fluoride-based caries prevention without the development of some degree of dental fluorosis, a defect of enamel caused by excess fluoride disrupting the development of enamel prior to tooth eruption.[45] The report refers to studies carried out by Dean which found that at 1mg of fluoride per litre, the reduction in the prevalence of dental caries was approximately 50% but this reduction was associated with very mild forms of fluorosis in a small percentage of the population - about 10%. At the time this low level of fluorosis was deemed not a public health problem; if it was even noticed it was considered acceptable and preferable to the severe dental caries it largely replaced. The question now arises whether the maximum caries preventive effect can be achieved without the appearance of some degree of very mild fluorosis, which is not aesthetically damaging and which usually cannot be seen by the untrained eye. It concluded that in communities where additional sources of fluorides are available, such as fluoridated toothpaste which may be swallowed by young children, the prevalence of inaesthetic forms of fluorosis will increase, and illustrates how in the USA much of the noticeable rise in the prevalence of very mild fluorosis can be accounted for by physicians prescribing fluoride supplements for children resident in fluoridated communities which it considers inappropriate. It concludes that dental fluorosis should be regularly monitored using indices sensitive enough to detect early changes in enamel following minor changes in fluoride intake and when mild or more severe fluorosis is found to a significant extent in a community, steps should be taken to reduce fluoride ingestion during the ages of

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45 op.cit. 2

tooth development. Chpater Four examines the incidence of fluorosis in Ireland. See also Table B2 and Table B3 at Appendix B.

Secondary effects of fluoride intake

The Fluorine Consultative Council considered the possible ill effects of increased fluoride intake in its report. It concluded that it is unlikely that a dose less than 4 gm of fluoride will cause death. It noted how an experimental dose of 250mg of sodium fluoride resulted in nausea, adominal discomfort and salivation which lasted a few hours. It noted that a person drinking 1 quart of fluoridated water (1p.p.m.F) daily can only ingest about 1mg. of fluoride.[46]

The Council also considered other health aspects which were further considered by Kenny J in the Ryan case when, he concluded that he was '*...satisfied beyond the slightest doubt that the fluoridation of the public water supplies in this country at a concentration of 1 p.p.m. will not cause any damage or injury to the health of anybody, young, old healthy or sick who is living in this country and that there is no risk or prospect whatever that it will. The evidence on which I base this view consists of a number of separate items each of which is conclusive; when taken together, they are overwhelming.*'[47] He referred to the WHO report published in 1958 and quoted its conclusions (see Appendix 1).

Fluorides and oral health were also considerd by a WHO Expert Committee on Oral Health Status and fluoride use which met in Geneva in 1993.[48] It considered other health aspects, such as osteoporosis, hip fractures,and skeletal fluorosis and their relationship

46 Rabuteau, A.P.A. These. Paris, (1867) and Balwin, H.B.J.Am. Chem. Soc., **21**,517 (1899)
47 Kenny J, par. 36 pg 22 Dept. of Health 1963
48 WHO Technical Report Series 846 (1994)

with fluoride use. The Committee concluded that with respect to hip fracture and bone health, there is no scientific evidence for altering current public policy on the use of fluorides for caries prevention. [49]

Health Effects of Ingested Fluoride

The health effects of ingested fluoride were considered by the National Research Council in the United States of America.[50] An animal study reported an equivocal increase in osteosarcomas (maligant bone tumors) in male rats but not in female rats at very high concentrations (100-175mg/l). However, that result was not substantiated in a subsequent study in rats at even higher doses. To prevent skeletal fluorosis (increase in thickness of bones) the U.S. Environmental Protection Agency (EPA) set the maximum contaminant level (MCL) for fluoride at 4mg/L of drinking water. The subcommittee considered that level appropriate as an interim measure. However, people can also ingest fluoride in toothpaste, mouth rinse, and dietary fluoride supplements or in beverages and food prepared with fluoridated water, it recommended further research in these areas and in dental fluorosis, bone strength and fractures, and carinogenicity and EPA's interim standared of 4mg/L should be reviewed when results of the new research become available and, if necessary revised accordingly.[51]

The WHO Expert Committee also considered this report and recommended that in countries with large water-fluoridation programmes, fluoridated water may be used in food processing, raising the fluoride content of the processed food above that of products for which unfluoridated water has been used, particularly where baby foods are prepared

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49 ibid. 12

50 Health Effects of Ingested Fluoride, National Health Council Subcommittee (1993)

51 Executive Summary op.cit. 11

It recommended that details of the nutrients, including fluoride, should be printed on the packages. It also recommends that dietary practices that increase the risks of infants and young children being overexposed to fluoride from all sources should be identified and appropriate action taken.

In Ireland the Food Safety Advisory Board established in 1996 a Working Group to consider the food safety implications of fluoride arising from its natural occurrence in the environment and its addition to public water supplies. With the establishment of the Food Safety Authority this Group has not met recently, but it is hoped that the Group will reconvene in the foreseeable future.[52]

POPULATION COVERED

Water fluoridation programmes have been introduced in 39 countries and reach over 170 million people, while an additional 40 million are served by water that is naturally fluoridated at a concentration of 0.7mg/lmg. or higher. Water fluoridation has been endorsed by more than 150 science and health organizations, including the Federation Dentaire Internationale (FDI), the International Association for Dental Research (IADR) and WHO.

In Ireland the Fluorine Consultative Council in recommending the fluoridation of public water supplies accepted that not quite 50% of the community would benefit even if all public water supplies were fluoridated at that time.[53] The first water supplies in Ireland were fluoridated in 1964. By the end of that year 26.5% of the total population were

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52 Source: Dept of Health & Children

53 pg 15 of Report

receiving fluoridated water supplies.[54] By 1970 this figure had risen to over 45%. In 1990 the figure based on 1986 Census had risen to 67.06% of the total population.[55] The most recent figures published using the 1991 Census of Population show that of a total population of almost 3.526m over 2.626m (74.47%) are served by fluoridated water supplies. 99.26% are in the Eastern Health Board region. Only 50.11% of the population in the Western Health Board receive fluoridated supplies. This is because of the high rural population, where a lot of the residence have private water supplies, or it would not be feasible to fluoridate a small public supply. A population of 800 -1000 people is normally required in order to make fluoridation of a supply practicable. Chapter Four will examine the various dental-health surveys which have been carried out either nationally or by individual health boards showing the results of water fluoridation.

ALTERNATIVES TO FLUORIDATION

The 1994 WHO report considered various forms of fluoride use. It concluded that salt fluoridation at a minimum concentration of 200mgF/kg should be considered as a practical alternative where water fluoridation is not feasible for technical, financial or sociocultural reasons. Provided that a community has a well developed milk distribution system, the technical procedures for producing fluoridated milk are straightforward and while results are encouraging more studies are required. Fluoride Supplements (tablets and drops) have limited application as a public health measure. Professionally applied and self-administered topical fluorides are indicated for persons and groups with moderate and high caries activity and for patients with special needs, especially in low-fluoride communities. Wider use of fluoride varnishes should be encouraged. In low

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[54] The progress of fluoridation in Ireland, J.Ir. Dent. Ass. (1972) 18 68-72

[55] Health Statistics 1990 Dept of Health , Stationery Office, Dublin 1991

fluoride communities, school based fluoride rinsing programmes are recommended but their adoption should be based on the cost of implementation and the caries status of the community.[56] In Ireland school-based mouth rinsing or tablets are used by health boards in some unfluoridated areas. The annual cost of providing mouth-rinsing in the Western Health Board area in 1990 was approximately £2.53 per child, where the Board provided such a service to over 22,000 children.

Fluoridated Toothpaste

The WHO report states that there is increasing evidence that the decline in the prevalence of dental caries in most industrialized countries in the past 20 years can be attributed mainly to the widespread use of fluoridated toothpastes. The production of candy-like flavours and toothpastes containing fluoride at 1500ppm or more are not recommended for use by children under 6 years of age. Children under the age of six should be supervised when brushing and less than 5mm of toothpaste (pea sized amount) placed on the brush.

[56] pgs 20 - 33 of WHO Report op.cit.

Chapter Three

Quality of Service

Health Strategy

The Health Strategy states that '*the (health) services must meet the highest possible quality standards within the resources that are available.*'[57] Applied to the fluoridation programme the technical quality of the service is an important factor. The service (supply of fluoridated water) must be such that the best possible outcome is achieved in return for the resources which are committed to it. The Strategy stresses that it is not sufficient to assess the services in terms of volume of the activity, a crucial element is a critical evaluation of the outcomes of services through techniques such as clinical audit. Efficiency and quality standards are also important.

World Health Organisation - Fluorides and Oral Health

The World Health Organisation's Expert Committee on Oral Health Status and Fluoride Use in its Report published in 1994 on ***Fluorides and Oral Health*** states that a crucial requirement for community water fluoridation is a well established, centralised, piped water supply. It is essential for the agency responsible for water-supply fluoridation to have the support of the leading health authorities and of the government. Water fluoridation should be considered a multiprofessional activity in which dentists, engineers, chemists, nutritionists, physicians and other professionals of the health sector should participate.[58]

The Report also states that an effective community fluoridation programme requires (a) suitable equipment available in a treatment plant or pumping station, (b) a constant supply

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57 Shaping a healthier future 11

58 paragraph 7.1 WHO Technical Report Series 846 (1994)16

of a suitable fluoride chemical, (c) workers in the water treatment plant able to maintain the system and keep adequate records, and (d) sufficient money for the initial installation and running costs. It follows that the level of dental caries must be sufficiently grave, to justify the investment. Provided that a large population is served, the cost per head can be very small, especially if the initial cost of equipment is spread out over a period of 5 - 10 years.[59] The Report recommends that all fluoridation plants should have effective fail-safe systems with well defined limits for the precision of measurements. In order to prevent over dosage, the plant must have a safety mechanism that stops the addition of fluoride automatically if the flow of water through the treatment plant is diminished suddenly.[60]

Technical Quality of the Service

Legislative Framework

Section 2 of the 1960 Act gives health authorities general responsibility for the fluoridation of water supplied to the public by sanitary authorities. It specifies the amount of fluoride which may be added to the water and provides that the Minister may make regulations as to how health authorities should perform their functions under the Act. (On establishment of the health boards under the Health Act 1970 the responsibility of health authorities was transferred to the health boards.)[61] The section also provides that the amount of fluorine which may be added to the water supply '*...shall not exceed one part by weight of fluorine per million parts of water*.'The first regulations made under the Act were in respect of Dublin, Kildare and Wicklow.[62] These and subsequent

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59 pg 16 para 7.2 op. cit.
60 pg 17 para 7.2
61 section 6 of Health Act 1970
62 S.I. Nos. 75, 76 and 77 of 1962.

regulations (in respect of other local authorities) specify that the local authority shall arrange for the:

(a) provision, installation and maintenance of equipment for fluoridation,

(b) the making of arrangements for the addition of fluorine to the water, and

(c) the testing of the fluorine content of the water to which the fluorine has been added.

The regulations also specify that after the addition of the fluoride, the water supply shall contain not more than one part of fluorine per million parts of water, and not less than eight-tenths of a part of fluorine per million parts of water. The regulations also provide that the fluoride may be added in the form of sodium fluoride or sodium silicofluoride complying with specifications in the Second Schedule to the Regulations. Subsequent Regulations and amendments provide for the use of hydrofluosilicic acid (which became available in Ireland at reasonable cost in the mid-sixties) and is now used in all plants. The regulations specify that the equipment used for fluoridation should be approved by the Minister for Local Government.[63] The Minister for the Environment and Local Government is the Minister responsible for Local Authorities who construct and operate public water supplies. That Department acts as the agent for the Department of Health & Children in the practical operation of the 1960 Act.[64]

The Regulations also provide for the monitoring of the fluoridated supplies. The fluorine content of the treated water shall be determined by a daily colorimetric test and distillation tests shall be carried out at intervals not exceeding two weeks during the initial six months and thereafter at intervals not exceeding four weeks.

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63 Now Minister for Environment and Local Government

64 Engineering Aspects of Fluoridation B.J. Tighe J. Ir. Dent. Assoc. **22** (1976) 88

Provision, installation and maintenance of equipment for fluoridation

Local (sanitary) authorities bear direct responsibility for the installation, maintenance and operation of fluoridation plants as agents for the Health Boards. It is estimated that the lifetime of fluoridation equipment in a water treatment plant is 15 to 20 years.[65] However, with repairs and maintenance a lot of the equipment will last much longer. A significant amount of the fluoridation plant now in use is more than 20 years old. The Department of the Environment and Local Government has considered in recent years the re-equipping of plants on a phased basis. However, this has not yet been pursued. A lot of the unsatisfactory monitoring results is caused by unreliable equipment, for example pump failures, rusty weighing scales, etc.

Engineering Aspects - Difficulties

Two major problems were identified in the 1984 Childrens Health Survey[66] in maintaining statutory levels of fluoride in water supplies over the previous 20 years. Firstly difficulties encountered in obtaining adequate supplies of fluoride at all times and secondly, the distribution of the fluoride to the different supplies throughout the country, particularly the smaller supplies. Difficulties of an engineering nature were also encountered with fluoridation plants using the fluoride compounds in powder form, i.e. sodium silico-fluoride, most relating to the consistency of concentration of the fluoride ion in the water. Experience had shown that the liquid acid type plants were more consistent in operation. As already stated in the late 1960s most water supplies changed over to the liquid method of fluoridation and new schemes installed equipment for the liquid acid. However, in 1974 a major problem arose when the main supplier of the

65 Water Section, Dept. of Environment & Local Government

66 Children's Dental health in Ireland 1984 - A survey conducted on behalf of the Minister for Health by UCC

liquid indicated that the supply of hydrofluosilicic acid could not be guaranteed. Because of shipping problems, etc there was a nine month period in 1975 when adequate supplies were not available.[67]

The problem of distribution arose because of the inaccessibility of many of the smaller waterworks where the large tanker was unable to travel through the narrow roads. This was solved by the purchase of a smaller and more versatile tanker.

In an article published in 1976[68] problems were identified which had arisen because of the quality of the equipment (i.e. metering pumps, etc.) not being adequate for the job of handling acid, the practical difficulty of accurately metering and controlling the small quantities of acid required on the smaller schemes, and the absence on most small schemes of skilled supervision for the maintenance of the delicate equipment involved. It was recommended that each installation should have a small day tank of acid in addition to the main storage tank, to enable more accurate determination of the quantity of acid used in any period of time. For this purpose the day tank is fitted with a graduated sight glass to read the contents and is carried on a weighing scales for accurate determination of the weight of acid used. All new Schemes are now installed with a second pump as standby. Most schemes now have a day tank and a weighing scales. It would not be possible to use a weighing scales on the larger Schemes.

The article recommended that only equipment which experience has shown to be entirely adequate for the required duty should be installed, and to replace all defective equipment

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67 op. cit. 22

68 Engineering Aspects of Fluoridation - B J Tighe, J. Ir Dent. Assoc (1976) 22; 88-93

with equipment that has proven reliability. It also recommended that the acid for smaller schemes should be diluted so that the higher pumping rates permit the use of larger and more reliable pumps. Control equipment should be simplified to the greatest possible extent and it recommended elimination of non-vital equipment.[69]

Because of the corrosive characteristics of hydrofluosilicic acid special conditions are required for storage and handling such as plastic or rubber lined containers. The specification for the acid states that it should contain 14% by weight of fluosilicic acid. Thus, 8 gallons of acid in one million gallons of water gives a fluorine content of one part per million. In the case of small schemes because the acid is flowing at such a slow rate it may cause damage to pumps, etc. and also dust particles, etc. may affect the pumps. Diluted acid is used in some of the smaller plants, but this can also cause problems because if the diluting equipment fails there is a danger of over dosage.[70]

Procedure for fluoridation of supplies

The need to improve or extend a public water scheme is identified by the Department of Environment and Local Government or the local authority concerned. The Local Authority notifies the relevant health board(s) and petitions the Board to ensure that fluoridation is carried out. This should be done at the planning stage. The health board is then sent an application by the local authority to improve/replace the fluoridation equipment. If the Scheme is covered by a fluoridation order the local authority will inform the health board of the location of the new source or alteration to existing source. The health board can then take samples of the water supply at these sources to test for the

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69 page 96 op. cit.

70 Source: Water Section, Dept. of the Environment

natural fluorine content in accordance with section 2(4)(a)(ii) of the 1960 Act. Alternatively, the local authority will take the samples and send them to the health board. The Local Athority will also advise the Health Board at the planning stage that it should provide for the running costs. The Local Authority will on completion of the plant send an invoice to the relevant health board to recoup the cost of the fluoridation plant in accordance with the provisions of section 4(1)(e) of the 1960 Act. Every supply which serves a population of more than about 800 people ideally should be fluoridated.[71]

Capital Grants of £250,000 in total were allocated to health boards by the Department of Health & Children in 1994 for new fluoridation plant and upgrading of existing plant. In 1995 £900,000 was made available and almost £500,000 was allocated in1996.

Supply of Hydrofluosilicic acid

Prior to 1990 the contract for the supply of Hydrofluosilicic acid was placed by the Department of Health when the price was agreed annually between the Department and a supplier. The acid was then purchased directly by Local Authorities from a supplier and the cost was recouped from the health boards. In 1990 the Eastern Health Board agreed to enter into an appropriate contract with a suitable supplier on behalf of all eight health boards for a five year period. A new contract was awarded to a different supplier from 1 July 1996 for a 5 year period. Competition for the contract was made under EU Directive for Supply 93/36/EEC and the award notice was published in the Official Journal of the European Communities. Approximately 650,000 imperial gallons of acid are used per year. The award criteria for the supply of the acid is *'to the most economically advantageous tender having regard to quality, security of supply, delivery,*

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71 pg 69-72 supra

price, distribution, storage, facilities, technical backup and assistance, technical and performance standards, after sales service, health and safety regulations and any other criteria necessary to ensure that value for money is achieved as specified in the tender documents'.

Cost of Fluoridation

The projected costs of fluoridation were examined by the Fluorine Consultative Council.[72] It found that the cost of a fluoridation programme will vary with the size of the community for which the programme is adopted. In Britain at that time the cost, including allowance for capital costs varied about 3½d to 7½d per head per year.

In November 1975 the cost of fluoridation plus operation costs was estimated at £3.50 per million gals. of water for hydrofluosilicic acid or 8p per head of population supplied.[73] (excluding overheads, repairs, maintenance, and depreciation. The approximate overall cost of a small Scheme of 1,000 population was estimated at £670 p.a. or 67p per person.

In 1996 the total annual cost per head of population who receive fluoridated water under the fluoridation programme, including capital, running costs, and the purchase of hydrofluosilicic acid was estimated at approximately forty two pence.[74] However, the prime beneficiaries of fluoridated water are children. If one assumes that 25 per cent of this population are under 14 years of age the cost per head of the target population would rise to £1.68 per head per annum.

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72 Fluorine Consultative Council Report par 29 & 30 pg 11
73 Engineering Aspects of Fluoridation - Tighe, B.J. J. Ir. Dent. Assoc. (1976) 22 ;93
74 Gavin, G Chief Dental Officer, Dept. of Health & Children (1997)

When calculating water usage the Department of the Environment & Local Government estimate that it provides 50 gallons (227 litres) of water per head of population per day or 18,250 gallons per annum. This allows for direct consumption, preparation of and cooking of food, bathing/showering, flushing toilet, etc. Eight gallons of the hydrofluosilicic acid will provide one million gallons of fluoridated water. The demand for water supplies in the Greater Dublin Area was estimated in 1994 at 452.5megalitres per day of which 36.37% was estimated as Domestic Demand.[75] However, present losses of production are estimated at 44% of total output (39% distribution losses and 5% customer losses.)

Monitoring of Supplies

As stated earlier the Regulations provide for daily colorimetric and monthly distillation tests of samples of the water to ensure that the concentration of fluoride is kept within the statutory parameters of 0.8 and 1ppm F.[76] The monthly distillation test is taken by the Environmental Health Officer for each supply in his/her Community Care area and it is analysed by the Public Analyst. Results are submitted to the Department of Health and Children on a quarterly basis in accordance with Circular 14/77. The results of the tests are also notified to the Health Board and the engineer in charge of the water works. Reasons for unsatisfactory results should be given and remedial action taken.

The ***1984 Children's Dental Survey***[77] identified that in a number of supplies the results of the distillation tests indicated that the levels of fluoride was less than 0.8ppm for long periods. Results from the Midland Health Board for the eight-year period from 1977 to

75 Dept. of the Environment, Greater Dublin Water Supply Strategic Study Report- June 1996
76 The progress of fluoridation in Ireland S O'Hickey , Ir. Dent Assoc. Journal (1972) 18 68
77 pgs 22 & 23

1984 inclusive showed that only 28 per cent were considered satisfactory (0.8-1.0ppm). In the North-Western Health Board area for this period only 21 per cent were satisfactory.

In 1985 the national figure for satisfactory results was 51.6%. Another 11.2% of the results were considered marginal (0.7-0.8 ppm and 1.0-1.1ppm) 5.2% of the results were considered to be overfluoridated. By 1994 the percentage of satisfactory results had risen to 66% with another 18% coming within the marginal limit. 68% of report results were satisfactory in 1995 and 14% were marginal. Complete statistics for 1996 and 1997 are not yet available.

The Environment Protection Agency (E.P.A.)

The E.P.A. also monitors the levels of fluoride in water supplies. In its annual report for 1995 on ***The Quality of Drinking Water in Ireland*** [78] it commented that proper care should be possible in the dosing of water with chemical additives such as fluoride and it is clearly not satisfactory that nearly half of the exceedences of the paramaters are in a concentration band quite markedly above the permitted value, and recommended that the supplies in question should be investigated forthwith. This point was reiteriated in its 1996 report. The Reports, however, welcomed the reduction in the number of exceedences - 15.9% in 1993, 13.3% in 1994 to 12.2% in 1995 and 9.45% in 1996. The Reports showed a compliance figure of 87.8% for 1995 and 90.55% in 1996. The Department of Health and Children would also be concerned at underdosing (<7ppm) as it would reduce the effectiveness of the measure.

[78] EPA The Quality of Drinking Water in Ireland, 1995 and 1996

Chapter Four

Accountability

The Strategy sets out new arrangements for improved legal and financial accountability. It identifies a need to develop effectiveness and value for money for the taxpayer. It states that '*the principle of accountability has a number of strands. It includes formal legal and financial accountability arrangements, which are in place and which are subject to ongoing development. It also includes the requirement on those providing services to take explicit responsibility for the achievement of agreed objectives. This has been lacking in the health services, and its development is a key element of the Strategy's organisational and management reforms. Finally, there must also be mechanisms to ensure that those with decision-making powers are adequately accountable to the consumers of the services.*'[79]

The Strategy also states that our ability to provide comprehensive and high-quality services is affected by both the level of resources which can be made available and the efficiency with which we use these resources.[80] It states that the emphasis in the future will be placed on achieving the greatest possible benefit from whatever resources are available.

The Strategy also refers to the fact that the objectives of services have until now tended to focus on the provision of a level of service rather than on the provision of a positive outcome. Effectiveness of a service is therefore, very important. The Strategy describes health and social gain as terms used to indicate that patients and clients of the health or

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79 Shaping a healthier future... 11
80 ibid. 12

personal social services should receive a clear benefit (or outcome) from their contact with the system. The application of these concepts relies heavily on the collection and analysis of accurate and comprehensive data, as a basis for:

- Better identification of the needs to be addressed.
- Better evaluation of existing and new technology, and of alternative approaches to the delivery of services.
- Ongoing monitoring and evaluation of the effectiveness of services, taking both costs and outcomes into account.

The future role of the Department of Health and Children will no longer be involved in the detailed management of individual services. Its principal responsibilities will be advising and supporting the Minister in determining national policy, strategic planning and management at national level, determining the financial allocation of the regional health authorities and monitoring and evaluating the service and financial performance of the authorities against national objectives and standards, and identifying and supporting the introduction of more effective management practices.

Dental Health & the Strategy

The Dental Health Action Plan aims to reduce the level of dental disease in children and to improve the level of oral health in the population overall. Oral health goals by the year 2000 include that , at least 85 per cent of five-year-olds in optimally fluoridated areas and at least 60 per cent of five-year-olds in less than optimally fluoridated areas will be free of dental caries (baby teeth only); and twelve year old children will have on average no more than 1 decayed, missing or filled permanent tooth in optimally fluoridated areas and *on average no more than 2 decayed, missing or filled permanent teeth in less than* optimally fluoridated areas.

Developments since the Health Strategy

Strategic Management Initiative (SMI)

Since 1994, under the Strategic Management Initiative (SMI) each Department or Office of the Civil Service has been identifying its strategic objectives and developing and implementing strategies for their achievement. The Co-ordinating Group of Secretaries, which was set up to oversee the implementation of SMI across the Civil Service, was asked by Government to make proposals to modernise the way in which the Civil Service makes decisions and to update personnel and financial management systems and practices in the Civil Service.[81] A **'Programme of Change for the Irish Civil Service'** pledges to reform our institutions at national and local level to provide service accountability, transparency, and freedom of information and *'the implementation of policies to reflect a commitment to the best quality of life for our people in terms of health-care...'*[82] The Report cites its vision for the Civil Service as one of operating to the highest standards of integrity, equity, impartiality and accountability with a mission and culture of quality services and value for money, simplified regulations operating efficiently and fairly. The Group see the process requiring attention to the objectives of service delivery and to indicators of success in achieving these objectives. The key aims of the change programme include delivering a quality customer service; the devolution of authority, responsibility and accountability to appropriate levels within the organisation; and the

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81 Delivering Better Government; The second report to Government of the Co-ordinating Group of Secretaries - A Programme of Change for the Irish Civil Service,2nd May, 1996 -Stationery Office, Dublin

82 ibid.6

introduction of statements of strategy for Departments and Offices which would define the broad framework and operating environment of the Organisation.

Health (Amendment) (No. 3) Act, 1996

This Act clarifies the respective roles of health boards and CEOs and strengthens financial accountability by a range of measures, including the requirement for each health board to prepare and adhere to an agreed service plan for each financial year and to publish an annual report. The Act imposes an obligation on health boards, in carrying out its functions to secure the most beneficial, effective and efficient use of resources; co-operate and co-ordinate its activities with other health boards, local authorities and public bodies and give due consideration to policies and objectives of Ministers and the Government.

Public Service Management Act 1997

sets a new statutory basis for the roles of the Minister and the Secretary-General of Departments. It provides that responsibility for the day to day management of the Department is assigned to the Secretary-General. This will involve implementing and monitoring policies, delivering goods and services of the Department, examining and developing means to improve the provision of cost effective services and ensuring that the Department's resources are used appropriately and with respect to value for money. It also places a number of responsibilities on Departments including the preparation of strategic statements and delegation of responsibility to assigned officers of the Department.

Freedom of Information Act, 1997

Members of the public will have full access, subject to some exceptions, to personal information and to other information from 21st April, 1998.

Expenditure Programme Reviews

The Department of Finance see these as a key part of the reform of financial management systems and which is central to the SMI. Dental Services are currently under review under this Programme.

The National Economic and Social Council in its report '***Strategy into the Twenty-first Century***'[83] recommends the implementation of the SMI process. The Council suggests that a series of forces for change have acted to cause a rethinking of the role of the public sector in many countries in recent years. These forces include new demands created by social change; transformed thinking about the nature of effective management in the public sector based on private sector and market principles and heightened consumer awareness of quality of service. It suggests that there has been a change from an emphasis on internal procedures to a concern for outcomes and change from an emphasis on hierarchical decision-making to an approach stressing delegation and personal responsibility. There is now a focus on quality rather than quantity of service provided. The Council suggests systematic and appropriately timed monitoring of the progress of national strategies and negotiated programmes to facilitate effective policy making. It suggests that monitoring of progress involves two issues relating to the measurement of change; the appropriate indicators (benchmarks) and the relevant comparators. Identification of relevant indicators is dependent on clear specification of programme and policy objectives and intended outcomes. Monitoring of progress relative to strategically chosen comparative cases helps to identify alternative strategies and it may illustrate the importance of the linkages between policy choices and policy outcomes. However, the value of comparative analysis is dependent on the selection of appropriate

[83] NESC Report No. 99 1996.

comparative cases and time periods. These could be a selection of most similar cases with the objective of explaining crucial differences; selection of most different cases with the objective of explaining why similar developments in some crucial aspect of policy have come about; or compare individual cases relative to average or median performance of clusters of countries such as OECD members or EU members.

Applying the Accountability Principle to Fluoridation

Section 2(4) of the Health (Fluoridation of Water Supplies) Act 1960 provides for, prior to fluoridation, surveys of the incidence of dental caries in school-going children and an analysis of the existing levels of fluoride in public water supplies of the functional areas to be fluoridated. The Act also provides that the amount of fluorine shall not exceed one p.p.m.F. In compliance with this section a baseline epidemiological study was conducted during the years 1961 to 1963 to determine the prevalence of dental caries in the school population in the Republic of Ireland and the public piped water supplies were analysed.

<u>Oral Health Surveys</u>

Health gain is an important measure of accountability. Section 6 of the 1960 Act requires the Minister for Health to arrange from time to time, surveys into aspects of health of persons who receive fluoridated water. A survey of Children's Dental Health[84] in Ireland was carried out in 1984 to determine the level of dental caries in Irish school children and to determine the effectiveness of water fluoridation by comparing the prevalence of dental caries in children in fluoridated and non-fluoridated areas and comparing the dental caries levels in 1994 with those of 1961-63. A third aim was to determine the levels of enamel opacities including fluorosis in fluoridated and non-fluoridated areas. The

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84 Children's Dental Health in Ireland 1984 carried out under the direction of the Department of Preventive and Paediatric Dentistry, University College, Cork

children selected represented 5, 8, 12 and 15 year olds. The Survey showed clearly that there had been a significant decline in the prevalance of dental caries in Irish school children in the previous 20 years, particularly in younger children who had been lifetime residents in a community served by a fluoridated water supply. (See Tables B1 and B2 at Appendix B). In the pre-fluoridation surveys carried out in 1961-1963, only 15 per cent of 5-yr.-olds were free of dental caries, compared to 38 per cent (non-fluoridated) and 52 per cent (fluoridated areas) in 1984. Among 8 year-olds examined in 1961-63, 34 per cent had no caries in their permanent teeth; in 1984 the survey found that 56 per cent of 8 year olds living in non-fluoridated areas and 69 per cent living in fluoridated areas had no caries in their permanent teeth. In the pre-fluoridation survey 2 per cent of 15 year-olds were caries free while in 1984 the figures were 8 per cent (non-fluoridated) and 12 per cent (fluoridated). The improvement in the non-fluoridated areas is attributable to the availability and widespread use of fluoridated toothpaste since the 1970s.

A survey was carried out in the Western health Board in 1991-1992 to obtain baseline information on caries levels prior to the introduction of a fluoride mouthrinsing programme, to measure changes in caries levels since 1984 and to evaluate the effectiveness of recent strategies including the use of fissure sealants since 1986. Children in age groups 5, 8 and 12 year olds were examined. It was found that lifetime residents of fluoridated communities (Full) had considerable lower caries experience than other groups e.g. the mean DMFT of 12-year-old lifetime residents of fluoridated communities was 1.6 compared with 2.1 in the other 2 groups.[85] (See Tables B4-B6 at Appendix B). Subsequent surveys have been carried out by health boards locally. In both the Southern and North Eastern Health Boards Oral health surveys of children and

[85] Children's Dental Health in the Western Health Board Region 1991-1992 (1994);9

adolescents in 1995 showed similar improvements in oral health status (See Table B2 at Appendix B) with children who get fluoride in their water supply having healthier teeth than those in non-fluoridated areas.

A survey on the Oral health of Irish Adults carried out in 1989-1990 showed that subjects who had resided in fluoridated communities had lower levels of decay in both the crowns and roots of their teeth.[86] In 45-54 age group the mean number of natural teeth present was 16.4 in the full fluoride group compared with 10.7 in the non-fluoride group. It also showed that oral health generally is better amongst residents of the Eastern Health Board when compared with residents from other parts of Ireland.e.g 65 years and over in Eastern Health Board area had an average of 10.6 natural teeth present, compared with 6.1 amongst those living in the rest of the country. The percentage of subjects with no natural teeth is higher amongst those who have never resided in a fluoridated community. The mean DMFT and mean anterior DMFT were generally lower in the 'Part' and 'Full' fluoridated groups. and root caries was lower in the full fluoridated group than in the 'Non' fluoridated group.

Levels of Fluorosis

The 1984 Children's Survey concluded that the incidence of fluorosis is negligible in Ireland. (See Appendix B Table B3). A national survey on the oral health status of Irish Adults was carried out in 1989-1990.[87] As a sizeable proportion of adults aged 16-24 would have spent all or some of their lives in a fluoridated community, it was decided to monitor levels of enamel opacities including fluorosis for this age group. See Table B4

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86 Oral health of Irish Adults 1989-1990 vii.

87 Oral health of Irish Adults 1989-1990 A Survey conducted by the Oral Health Research Centre, University College Cork, (1992) Dublin Stationery Office;47

at Appendix B. Using Dean's index it was found that 95 per cent or more of this age group in the Part or Full fluoride categories showed no evidence of fluorosis, 4 per cent had questionable and 1 per cent very mild scores. Only one subject was placed in the very mild category.

More recent studies of 8 year -olds were conducted in the Western, (1991) North-Eastern (1993) Eastern (1993) and Southern (1995) health boards. The results showed that in the Southern and Western Health Boards 91 per cent of children showed no signs of dental fluorosis in fluoridated and non-fluoridated areas. In the east and north-eastern region approximately 75 per cent of 8 year olds had no evidence of dental fluorosis which is not detectable to an untrained eye, with 5.5 per cent in the very mild or mild category. Overall the levels of fluorosis are still lower than that predicted by Dean in 1946 and in similar communities in the United States with fluoridated water supplies.[88]

Other Accountability Procedures

As stated earlier the EPA includes fluoride in its Annual Reports on the quality of drinking water. In future health boards in submitting their annual service plans to the Department of Health & Children will be required to provide the total number and percentage of population of each Community Care area covered by public water fluoridation programmes. An estimate of the number of school-going children not covered by water fluoridation together with the number of children covered by fluoride mouthrinsing. The percentage of monitoring results within the statutory limits and percentage of fluoridation plants operating at optimum level and details of monitoring

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88 Reply to Parliamentary Question No 110, 11 February 1998 Parliamentary Debates Dail Eireann, Official Report (1998) 487, No. 1 178-179

arrangements, i.e. Local Monitoring Committees are also required. These committees include principal dental surgeons and appropriate engineering staff of the local authority.

The Department of Health & Children will soon advertise for tenders for a consultancy contract in Epidemiology, which will develop and co-ordinate research projects including evaluating the effectivenss and efficiency of oral health service interventions including fluoridation of public water supplies.

Oireachtas Members can raise questions in the Dail on any aspect of water fluoridation, or make representations to the Minsiter. The number of parliamentary questions has increased recently but this may be due to the increased membership of the Green Party in the House. Members of the public can also make representations to the Minister or Department. The Secretary-General of the Department is required from time to time to go before the Public Accounts Committeee to answer questions relating to particular issues affecting the Department, which could include fluoridation. Organisations such as the Pure Water Association who are opposed to water fluoridation keep a watchful eye on developments and studies carried out.

Chapter 5

Conclusions and Recommendations

Although it is thirty-eight years since the Health (Fluoridation of Water Supplies) Act, 1960 was passed by the Irish Legislature it is an effective piece of legislation which has withstood the passage of time.

There is overwhelming evidence, from recent oral health surveys to show that since the introduction of fluoridation of water supplies at the optimum level of 1 ppm F there has been a significant reduction in the incidence of dental caries in children and the oral health status of both adults and children has improved. While this may be partly attributable to the increased availability and use of fluoride toothpaste the surveys have shown that those who have resided in fluoridated areas for a significant period of time have lower levels of dental decay and the mean number of natural teeth present is also higher.

Dental caries is recognised as a world wide disease which affects all economic and social-classes. In that sense, water fluoridation is an equitable measure as it benefits everyone who is exposed to a fluoridated source of drinking water. However, large areas of the country, particularly rural areas are discriminated against because of geographic location. The use of alternatives, such as school-based mouthrinsing programmes should be encouraged in non-fluoridated areas.

In relation to health effects, the same claims are now being made as were forty years ago when the procedure was considered by the Fluorine Consultative Committee. The World

Health Organisation is the leading authority in this regard and it has concluded that it is safe and effective. It is also the most efficient, i.e. cost-effective method in reducing the level of dental decay significantly at a very modest cost. It is important, however, that the Working Group on the food safety implications of fluoride ingestion complete its studies.

There is concern in relation to the incidence of fluorosis. While this may be due to overuse and ingestion of toothpaste, occurrences need to be carefully monitored. Therefore, the aim of all water authorities should be to achieve sampling results within the optimum limits. Distillation test results which exceed the prescribed limits should be examined carefully and breaches of the statutory limit of 1.0ppm should not be tolerated.

It is recommended that the incidence of fluorosis should be closely monitored by the health boards. Where there are a number of patients in a particular area showing signs of fluorosis their history of fluoride use should be examined, e.g. swallowing of toothpaste etc. The subject's water source(s) should also be traced and, if a fluoridated public water supply, the monitoring tests for that particular supply should be historically examined for exceedances of the statutory limit of 1 p.p.m. F. Similarly, where a particular supply's monitoring tests show a pattern of exceedances of the statutory limit, the children resident in the areas served by that particular supply should be carefully screened at school health examinations for indications of fluorosis.

The Department of Health and Children should continue to keep abreast of all new studies and reports on fluoridation and actively participate in conferences, seminars, etc., as resources of the Department permit.

In relation to quality of service, monitoring returns continue to show a rise in satisfactory results, despite the fact that at this stage a lot of the machinery has probably exceeded its normal lifespan. However, there are still a large number of monitoring test results which fail to satisfy the statutory fluoride levels of 0.8 -1.0 p.p.m.F. The Freedom of Information Act will heighten the need for optimum fluoride levels to be maintained. Most exceedances of optimum levels are probably attributable to obsolete equipment. While a significant number of smaller plants are being upgraded or amalgamated to form larger supplies there are a significant number of older plants which need upgrading. There is a need for a complete audit of all plants to identify the age and condition of equipment.

As water fluoridation is an ancillary operation of a water supply scheme it must comply with the scheme as operated by the water authority. However, the funding for fluoridation is the responsibility of the Minister for Health & Children. Ideally, this burden should be transferred to the local authority, so that it could then plan its capital programme more effectively. Because of the emotive issues involved in the fluoridation debate and past experience, the Department of Health & Children would be reluctant to make any amendments to the legislation to place the financial burden on the Department of Environment and Local Government. There is, therefore, a need to have a sufficient annual amount of capital money available to keep all plants operating at a satisfactory level.

Even in a tiger economy the resources available for health services will never satisfy the demand. Water fluoridation, by significantly improving the oral health status of the population has relieved the financial burden on the State to provide dental treatment.

In conclusion, the provisions of the Health (Fluoridation of Water Supplies) Act 1960 and regulations made under the Act, if strictly adhered to will ensure that the fluoridation of public water supplies satisfies the three underlying principles of the Health Strategy and also the central aim of SMI, the delivery of quality services to the public.

APPENDIX A

WORLD HEALTH ORGANISATION 1958

SUMMARY OF THE CONCLUSIONS OF THE EXPERT COMMITTEE ON WATER FLUORIDATION

1. Dental caries is one of the most widespread and prevalent diseases
2. There is no hope of controlling the disease by present treatment methods alone.
3. Among the numerous preventative methods, fluoridation of drinking water supplies is the most promising.
4. The effectiveness, safety and practicability of fluoridation as a caries-preventative measure has been established.
5. 1 p.p.m. fluoride has been shown to give maximum benefits; first by epidemiological studies where fluoride occurs naturally in the water and secondly, where fluoride has been added at optimum concentration through mechanical means.
6. Hundreds of controlled fluoridation programmes are now in operation in many countries. Some have been in progress for the past 12 years, so that conclusions are based on experience. No other public health procedure, during the initial stages of its application, has had such a background in time or extent.
7. The biological effects of fluoride have been described in nearly 3,000 clinical and experimental reports in the past 20 years. This literature is not only extensive but of broad scope.
8. Fluoride penetrates cells and in sufficiently high concentrations inhibits certain enzymes, but no evidence of enzymal inhibition has been found in persons drinking fluoridated water containing concentrations of fluoride optimal for dental health.
9. Most of the fluoride absorbed into the system is rapidly excreted, principally in the urine; the rest is deposited in the minerals of the bones and teeth.

10. When large doses or excessive amounts of fluorides are ingested for protracted periods (many years) the skeletal system exhibits structural changes. The clinical manifestations are classed (a) crippling fluorosis (20-80 m.g. of fluoride or more per day for 10 to 20 years); calcification changes in bone together with calcification of ligaments (b) asymptomatic osteosclerosis (more than 5 m.g./l of urine excreted daily for 5 to 10 years; hypercalcification in one or more bones without disability); and (c) mottled enamel (drinking water containing 2 to 8 p.p.m. fluoride or more during the first 8 years of life; interference with enamel formation, stained or in severe cases irregular enamel surfaces). Adequate factors of safety guarantee the absence of these changes when water containing 1 p.p.m. fluoride is drunk.
11. Toxic doses of fluorides (50 times) that used in controlled water fluoridation) injure the kidneys. There is no evidence of kidney injury or any effect on concurrent kidney disease in the populations drinking fluoridated water where fluoride concentrations range up to 5 p.p.m.
12. No relation between thyroid dysfunction and naturally fluoridated water has been established. In animal studies, daily doses in excess of 50 p.p.m. in the diet produced structural and functional changes in the thyroid. In humans, drinking water containing 1-5 p.p.m. is without demonstrable effect on the thyroid.
13. Growth and development, somatic and psychic, are normal in children drinking water containing 1 p.p.m. fluoride.
14. The formation of teeth and even their resistance to caries and their appearance are improved when water containing optimum concentrations of fluoride is consumed.
15. Over 3 million people in the U.S.A., over half a million in England, and large population groups in other countries have, during their lifetime, consumed water

containing 1 p.p.m. fluoride or more. Mortality and morbidity rates for five leading causes of death are comparable for cities in the U.S.A. with fluoride and non-fluoride public water supplies. No relation between fluoride and arthritic changes in bones has been found, nor have confirmed cases of allergy to water containing 1 p.p.m. fluoride been described.

16. The addition of fluorides to public water supplies has proved to be similar to other routine mechanical procedure widely employed in waterwork practice. Suitable equipment has been developed, reliable analytical procedures are available and appropriate safeguards have been established.

17. No other vehicles or techniques for the prophylactic application of fluorides can at present replace the fluoridation of drinking water as a public health measure. Where water fluoridation cannot be used, research into other vehicles and improved methods of local fluoride application should, however, be encouraged.

CONCLUSIONS

1. Drinking water containing about 1 p.p.m fluoride has a marked caries-preventive action. Maximum benefits are conferred if such water is consumed throughout life.
2. There is no evidence that the water containing this concentration of fluoride impairs the general health.
3. Controlled fluoridation of drinking water is a practicable and effective public health measure.

APPENDIX B

TABLE B1

Childrens Dental Health in Ireland 1984

Percentage of children with no known caries experience (caries free)
in each age grouping by fluoridation status and health board
(deciduous teeth in 5 year olds permanent teeth only in 8-, 12- and 15-year olds)

Age Grouping	5 year olds		8 year olds		12 year olds		15 year olds	
Health Board	Full Fl	Non Fl	Full Fl	Non Fl	Full Fl	Non Fl	Full Fl	Non Fl
	%	%	%	%	%	%	%	%
Eastern	56.8	37.4	72.2	55.4	27.3	14.9	15.8	13.4
Midland	54.5	33.7	75.2	57.0	26.9	25.0	9.1	8.9
Mid-Western	44.6	36.4	60.0	46.8	17.9	10.5	4.5	5.1
North-Eastern	66.3	46.0	73.3	66.4	21.3	15.9	10.2	9.2
North-Western	52.2	40.3	59.6	58.6	21.2	16.0	16.7	5.6
South-Eastern	50.4	37.6	78.8	50.5	30.8	11.4	16.7	4.9
Southern	38.7	30.1	58.2	53.7	13.9	10.5	3.2	4.7
Western	58.8	46.8	75.6	59.8	26.6	18.2	14.3	8.2
All Health Boards	52.1	38.5	69.5	55.7	22.8	14.7	11.9	7.8
Reproduced from Children's Dental Health in Ireland (December 1986) Table 2.1.pg 13								
1961-63 surveys		15.0		34.0		6.0		2.0

Full Fl = Home water supply fluoridated since birth. Subject may have had exposure to school fluoridation, fluoride tablets or fluoride mouthrinses

Non Fl = Home water supply never fluoridated. Present school water supply is not fluoridated. Subject never had fluoride tablets or mouthrinses.

Appendix B
Table B2

Mean number of decayed missing and filled teeth in 5-year-olds (dmft), 8-, 12-, and 15-year-olds (DMFT) in 1961-63 and in 1984

Age	5-year-olds			8-year-olds			12-year-olds			15-year-olds		
Health Board	1961-1963	1984		1961-1963	1984		1961-1963	1984		1961-1963	1984	
		Full Fl	Non-Fl		Full Fl	Non-Fl		Full Fl	Non-Fl		Full Fl	Non-Fl
Eastern	5.6	1.3	2.9	2.0	0.5	1.0	5.2	2.2	3.4	8.8	3.7	4.8
Midland	5.2	1.9	3.0	1.6	0.5	0.9	4.6	2.5	2.5	8.0	3.5	3.9
Mid-Western	6.4	2.3	4.0	1.9	1.0	1.1	4.9	3.1	3.7	8.2	4.3	5.9
North-Eastern	5.0	1.0	2.1	1.5	0.5	0.6	4.3	2.3	2.8	7.7	4.1	5.2
North-Western	5.2	1.7	3.0	1.5	0.8	1.1	4.2	2.4	3.9	7.8	2.3	5.8
South-Eastern	6.3	1.9	2.8	1.8	0.4	1.2	5.2	2.2	3.5	8.9	4.0	5.6
Southern	6.4	2.5	4.0	1.9	0.9	1.0	5.4	3.3	4.1	9.5	5.4	6.8
Western	5.0	1.5	2.2	1.4	0.4	0.9	4.2	2.3	3.0	7.3	4.5	4.8
All Health Boards Table 2.13 of 1984 Report	5.6	1.8	3.0	1.7	0.6	1.0	4.7	2.6	3.3	8.2	4.1	5.4
Southern Health Board		1995 Results for same age groups										
1995 Survey		1.1	2.3		0.3	0.5		1.3	1.8		2.8	4.3
North Eastern Health Board												
1995 Survey		1.2	1.8		0.3	0.3		1.2	1.6		2.2	2.7

Appendix B (cont.)

Table B3

1984 Survey

Percentage of 8- and 15- year old children with different grades of dental fluorosis (Dean's Index)

AGE	Normal		Questionable		Very mild		Mild	
	Non Fl	Full Fl	Non Fl	Full Fl	Non Fl	Full Fl	Non Fl	Full Fl
8 years	98.1	94.0	1.9	5.0	0.0	1.0	0.0	0.0
15 years	99.4	94.7	0.6	4.0	0.0	0.9	0.0	0.4

Reproduced from Children Dental Health in Ireland 1984; 44

TABLE B4

Percentage of adults aged 16-24 with different grades of dental fluorosis (Dean's Index) by fluoridation status

AGE	Normal		Questionable		Very mild		Mild	
	Fluoridation Status		Fluoridation Status		Fluoridation Status		Fluoridation Status	
	Non	P & Full	Non	P & Full	Non	P & Full	Non	P & Full
16 - 24	96.0	95.0	4.0	4.0	0.0	1.0	0.0	0.4

Reproduced from Oral health of Irish Adults 1989-1990; 47

Fluoridation Status:
Non: subjects who have less than one years exposure to domestic water fluoridation
Full: subjects who have lifetime exposure to domestic water fluoridation
P: (Part) All other subjects

Deans Index: 0 = Normal
1 = Questionable
2 = Very Mild
3 = Mild
4 = Moderate
5 = Severe

Appendix B (cont.)

TABLE B5

CHILDRENS DENTAL HEALTH IN THE WESTERN HEALTH BOARD REGION
1991-1992

Percentage of Subjects with no caries experience (caries free) in each age group in each Community Care Area

	AGE GROUP			
Community Care Area	5.0	8.0	12.0	15.0
Galway	55.5	69.8	34.7	
Mayo	52.5	81.6	49.8	
Roscommon	62.8	87.6	49.2	
W.H.B.	56.1	76.2	41.7	
1993 EHB Comparison	70.0	81.0	42.0	29.0

TABLE B6

Western Health Board 1991-1992

Percentage of subjects with no known caries experience according to fluoridation status

	5.0	8.0	12.0
Non	42.4	78.4	44.1
Part	56.5	70.9	41.8
Full	68.1	82.1	48.2
	61.5	78.5	45.7

Appendix B (cont.)

Table B6

WESTERN HEALTH BOARD

Mean number of decayed, missing and filled teeth in 5-year-olds (deciduous teeth, dmft), in 8 year-olds (deciduous and permanent teeth dmft/DMFT) and in 12-year-olds (permanent teeth DMFT) by fluoridation status

	5.0			8.0			12.0		
	Non	Part	Full	Non	Part	Full	Non	Part	Full
Galway	2.3	1.4	0.8	0.8	0.5	0.4	2.6	2.0	1.9
Mayo	2.0	2.4	1.3	0.3	0.8	0.3	2.6	2.4	1.5
Roscommon	2.1	-	1.1	0.6	-	0.4	1.4	-	1.3
WHB	2.1	1.9	1.0	0.5	0.7	0.4	2.1	2.1	1.6

Reproduced from Children's Dental Health in Western Health Board Region 1991-1992;10

The Eastern Health Board mean dmft for 5 year olds in its 1993 survey was 0.9 in all areas (not classified as fluoridated or non-fluoridated), 0.3 (DMFT) 8 year olds, 1.4 (DMFT) for 12 year olds and 2.5 (DMFT) for 15-year-olds.

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