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North South Survey of Children's Oral Health in Ireland 2002

North South Survey of Children's Oral Health in Ireland 2002

A collaborative project involving:

Republic of Ireland

The Department of Health and Children
Health Services Executive, formerly the health boards:

East Coast Area
Midland Area
Mid Western Area
North Eastern Area
Northern Area
North Western Area
South Eastern Area
Southern Area
South Western Area
Western Area

Northern Ireland

The Department of Health Social Services and Public Safety

Eastern Board
Northern Board
Southern Board
Western Board

WHO Collaborating Centre for Oral Health Services Research University
College Cork

Final Report – December 2006

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Executive Summary

Highlights

- Since 1964, water supplies in the Republic of Ireland (RoI) have been adjusted to 0.8 to 1.0 parts per million (ppm) fluoride. Currently 71% of the population receive fluoridated domestic water supplies.
- In RoI, decay levels are lower among children with fluoridated domestic water supplies than they are among those with no domestic water fluoridation.
- Decay levels are lower among children who get fluoride in their water supply in RoI than they are among children in Northern Ireland (NI, no water fluoridation).
- Although decay levels are higher amongst the less well off, disadvantage does not account for the difference seen between fluoridated and non fluoridated areas. Fluoridation is effective in both disadvantaged and non disadvantaged groups.
- The prevalence of dental fluorosis (most commonly seen as paper white patches or fine white lines on the tooth enamel) is higher amongst children and adolescents with fluoridated water supplies.
- Despite the effectiveness of water fluoridation and fluoride toothpastes, there is little cause for complacency since tooth decay continues to be a very common disease. For example by age 15, 73% of adolescents with fluoridated water supplies in RoI already have decay in their permanent teeth, this compares with 81% in non fluoridated NI.
- Children in RoI have amongst the highest frequency of consumption of foods and drinks sweetened with sugar when compared with 34 other countries (WHO). Given their unfavourable dietary habits and average or below average frequency of brushing (WHO), water fluoridation continues to be an important preventive agent for the control of dental decay levels in Ireland.
- The factors associated with variation in decay levels amongst 15-year-old adolescents in RoI were fluoridation status, parents' occupational status, frequency of tooth brushing, method of rinsing after tooth brushing and frequency of snacking.
- In NI, there were two factors found to be associated with varying decay levels amongst 15-year-old adolescents, these were parents' occupational status and amount of toothpaste used when brushing.
- The level of oral hygiene was judged to be unsatisfactory for the majority of children in RoI; this variable was not measured in NI.
- The percentage of 15-year-olds who were under orthodontic treatment or had completed treatment rose from 14% in 1984 to 23% in 2002 in RoI.
- Dependants of medical card holders were less likely to have had orthodontic treatment than those without medical cards (17% vs 26%).
- Amongst 15-year-olds, 22% of those in RoI had trauma to their anterior teeth, compared with 14% in NI. A high proportion of this trauma to anterior teeth remains untreated in RoI.
- In RoI, one in five 12-year-old children, and one in three 15-year-old adolescents, had tooth wear exposing dentine on at least one anterior permanent tooth.
- In RoI, 46% of parents were 'very satisfied' and 37% were 'satisfied' with the dental service provided to their children, 4% of parents were either 'dissatisfied' or 'very dissatisfied' with the service. In NI, almost all the parents completing the questionnaire were either 'very satisfied' (69%) or 'satisfied' (29%) with the service provided.

Summary

Since the implementation in 1964 of the Health (Fluoridation of Water Supplies) Act 1960, water supplies in RoI have been adjusted to 0.8 to 1.0 parts per million (ppm) fluoride. Currently 71% of the population of RoI receive fluoridated domestic water supplies. Results of a National Survey of children's and adolescents' oral health carried out in 1984 showed that there had been a major decline in dental caries levels both in fluoridated and non fluoridated areas since the pre-fluoridation surveys conducted between 1961 and 1963. Regional oral health surveys carried out in the 1990s indicated a continuing decline in dental caries levels amongst 5-, 8-, 12- and 15-year-old children and adolescents in RoI.

The health strategy in Ireland has placed great emphasis on the collection of quality information on health and its determinants, for health policy planning and evaluation. This North South survey of children's oral health provides extensive data for representative samples totaling 19,963 children and adolescents on a variety of oral diseases, conditions and related parameters. The data are nationally and internationally comparable and provide a basis for planning and evaluating oral health policy in Ireland.

A critique of many studies of the effectiveness of water fluoridation was their failure to control for confounding factors. Socio economic factors are important variables to take into account when comparing caries levels amongst different communities. Thus, the survey was designed to compare the prevalence of caries between child and adolescent residents in fluoridated and non fluoridated communities in RoI whilst controlling for disadvantage (medical card ownership by child or parents). It also reports the changes in caries levels over time in RoI and reports changes in levels of dental fluorosis between 1984 and 2002.

The specific aims of the survey as set out in the protocol were:

- To measure levels of oral health in children and adolescents in Ireland in 2002, and to compare these data with local surveys conducted in the 1990s, national surveys conducted in 1984 and 1961–'63, and with data from international surveys.
- To provide a standardised up-to-date database on the oral health of children and adolescents in Ireland.
- To provide information on the oral health gain in children and adolescents since the last national and local surveys.
- To examine the relationship between water fluoridation and dental caries whilst controlling for age group, gender, behavioural aspects and medical card ownership.
- To assess oral health knowledge, attitudes and behaviour amongst children and adolescents, and to link these with oral health status.
- To compare the level of oral health of children attending schools designated 'special needs' by the Department of Education and Science with those of the general population (reported separately).
- To assess the perceived availability, accessibility and acceptability of the oral health services to children and adolescents with special needs and to their parents (reported separately).
- To provide information for the evaluation and future planning of oral health services in Ireland.
- To explore the relationship between medical card ownership and oral health.

The study was a cross sectional oral health survey of a representative, random, stratified sample of 5-, 8-, 12- and 15-year-old children and adolescents in RoI and NI. Internationally comparable

standardised examination criteria were used to record the prevalence and level of dental caries, enamel opacities (including fluorosis), oral hygiene, orthodontic treatment need, trauma and tooth wear. Questionnaires were also completed by 15-year-olds and parents of 8-year-olds. The questions were set to ascertain the children and adolescents' oral health attitudes and behaviour and the perceived availability, accessibility and acceptability of oral health services.

The survey shows that decay levels are much lower in 2002 than they were in 1984. Decay levels are lower among children with fluoridated domestic water supplies. Although decay levels are higher amongst the less well off, disadvantage does not account for the difference seen between fluoridated and non fluoridated areas. In contrast to many other health promotion activities, which are ineffective among the less well off, water fluoridation prevents dental decay across the social divide.

Whilst decay levels are lower, the prevalence of dental fluorosis is higher amongst children and adolescents with fluoridated water supplies. Comparisons with 1984 data show an increase in the prevalence of fluorosis since that time. Enamel fluorosis has been defined as a "dose-response effect caused by excess fluoride ingestion during the pre-eruptive development of teeth". This change in the enamel surface is characterized by an altered appearance, ranging from the more common fine white lines or patches to the less frequently occurring hypoplasia, pitting of the enamel surface and a change in tooth morphology in more severe forms. As fluoride has beneficial effects, the extent to which enamel fluorosis is considered by a population to be a public health issue will be best evaluated by offsetting the benefits against the risks. The risks associated with dental decay are that it may result in the loss of teeth, is costly to treat, can be aesthetically disfiguring, and can be associated with a degree of pain. In young children, decay may give rise to the need for general anaesthesia for treatment. Fluoride can reduce dental decay and a certain level of enamel fluorosis may enhance the appearance of teeth. The magnitude of concern that a population of people may have for greater (more severe) levels of enamel fluorosis must be weighed against the magnitude of concern that may be had for a certain level of tooth decay. Research is currently underway to assess the cosmetic impact of mild enamel fluorosis in an Irish context. This work is being carried out by the Oral Health Services Research Centre in University College Cork and is funded by the Irish Health Research Board.

The relative contribution of fluoride toothpastes and water fluoridation to enamel fluorosis in Ireland should be studied further. Recent research suggests a significant relationship between patterns of toothpaste usage in infancy and prevalence of fluorosis at age eight years amongst children in counties Sligo and Leitrim. These findings support those of international research, which indicate that early use of fluoride toothpaste in infants leads to excessive ingestion and absorption of fluoride at a time when the enamel of the permanent teeth is forming, leading to fluorosis of the permanent incisor teeth. A recent review of water fluoridation in Ireland, 'The Forum on Water Fluoridation 2002', was commissioned by the Minister for Health. The report of the review group made recommendations regarding the rational use of fluoride toothpaste and the reduction of the level of fluoride in the water supplies. It is anticipated that adoption of the recommendations will minimize the occurrence of dental fluorosis and at the same time maintain the important caries preventive benefits experienced to date. There is a need for constant monitoring of dental fluorosis in Ireland.

Levels of dental decay and enamel fluorosis among children and adolescents in the fluoridated RoI are also compared with those in the non fluoridated NI. Caries levels are lower among children who get fluoride in their water supply in RoI than they are among children with non fluoridated water supplies in RoI and NI.

Despite the overall decline in decay levels over the last three decades, there is little cause for complacency since tooth decay continues to be a very common childhood disease. For example by age 15, 73% of adolescents with fluoridated water supplies in RoI already have decay in their permanent teeth, this compares with 81% in non fluoridated NI. A recent WHO study revealed that Ireland was amongst the worst of 35 countries studied when it came to child and adolescent consumption of sweets and soft drinks and tooth brushing habits. For example, of the 35 countries surveyed, Ireland ranked second for daily sweet consumption at age 13. In the present study, over half of the 8-year-olds and approximately two thirds of 15-year-olds in RoI and NI consumed sweet snacks twice a day or more often. The present study also showed that there has been a substantial increase in the frequency of snacking among 8- and 15-year-olds in RoI since 1984. In the WHO study, tooth brushing frequency (twice daily or more often) was lower than the 35 country average for girls (67% compared to 73%) and similar

to the average for boys (54% compared with 52%). In the study described in this report, frequency of tooth brushing was higher in NI than in RoI. In RoI, the frequency has increased since 1984. In NI, 92% of 8-year-olds and 91% of 15-year-olds reported visiting the dentist at least every 12 months. In RoI, the percentage is much lower at 42% for 8-year-olds and 50% for 15-year-olds. In RoI, 21% of 8-year-olds and 18% of 15-year-olds had never been to a dentist compared to 1% and 2%, respectively, in NI. Given these relatively unfavorable habits, the level of dental decay in RoI is remarkably low; this is likely to be due to the fluoridation of water supplies. This is evidenced by the higher levels of decay among those in non fluoridated areas of RoI and NI, where the dietary habits are similar but there is no water fluoridation.

Statistical analysis of the clinical and questionnaire data combined showed that the factors associated with variation in decay levels amongst 15-year-old adolescents in RoI were fluoridation status, parents' occupational status, frequency of tooth brushing, method of rinsing after tooth brushing and frequency of snacking. In NI there were just two factors found to be associated with varying decay levels amongst 15-year-old adolescents, these were parents' occupational status and amount of toothpaste used when brushing.

Whilst water fluoridation is providing valuable protection from dental caries for the Irish population, future health promotion programs need to target the frequency of consumption of foods and drinks sweetened with sugar and frequency of tooth brushing with fluoridated toothpaste among Irish children and adolescents. The recommendations of the Forum on Fluoridation are aimed at addressing the reported increase in dental fluorosis among Irish children. The impact of these recommendations, including the lowering of the level of fluoride in the water, on dental decay and fluorosis will be monitored.

The level of oral hygiene was said to be unsatisfactory for the majority of children. Over two thirds of children were said to require oral hygiene instruction with 11 – 21% needing professional cleaning to remove plaque or calculus.

Amongst 15-year-olds, 23% had previously undergone orthodontic treatment or were currently undergoing orthodontic treatment. Dependants of medical card holders were less likely to have had orthodontic treatment than those without medical cards (17% vs 26%). Thirty six percent of 12-year-olds and 29% of 15-year-olds were recorded as having a definite need for treatment for either aesthetic reasons or due to the presence of occlusal anomalies.

The percentage of 15-year-olds who were under orthodontic treatment or had completed treatment rose from 14% in 1984 to 23% in 2002 for RoI as a whole.

Amongst 8-year-olds in RoI, 6% had traumatic injuries to their permanent incisors, amongst 12-year-olds this figure was 20%, and amongst 15-year-olds it was 22%. The prevalence of traumatic injuries in corresponding age groups in Northern Ireland (NI) were lower at 6%, 15% and 15%. The prevalence of traumatic injuries to permanent incisors was higher amongst males than amongst females in RoI and NI and higher amongst those with an increased overjet ("prominent teeth") in RoI. A high proportion of traumatic injuries to the permanent incisors of children in RoI remain untreated, a phenomenon also reported in 1984.

Tooth wear on the upper permanent anterior teeth was recorded in RoI once it had progressed through the tooth enamel and into the dentine. Tooth wear increased with age. One in five 12-year-old children, and one in three 15-year-old adolescents, had dentine exposed on at least one anterior permanent tooth. Children in the 15-year-old age group who brushed once a day or less had more tooth wear than those brushing more frequently.

Attitudes to tooth retention are changing. In RoI, the percentage of parents of 8-year-olds claiming that they would prefer an aching back tooth filled rather than extracted increased substantially in the last 18 years from 72% in 1984 to 89% in 2002. In NI, in 2002, the percentages choosing filling of an aching back or front tooth were very similar to those in RoI. In RoI, 46% of parents were 'very satisfied' and 37% were 'satisfied' with the dental service provided to their children, 4% of parents were either 'dissatisfied' or 'very dissatisfied' with the service. In NI, almost all the parents completing the questionnaire were either 'very satisfied' (69%) or 'satisfied' (29%) with the service provided.

Chapter 1

Introduction

1.1 Introduction

This report presents the final results of the North South Survey of Children's Oral Health conducted in Ireland in 2001 and 2002. The last National Survey of Children's Oral Health in the Republic of Ireland (RoI) was carried out in 1984. Life in Ireland has changed considerably since 1984: Oral health services and the climate in which they are provided has changed. Our health strategy demands equity, quality, accountability, and people-centeredness in service delivery¹. The importance of appropriate information to the planning and evaluation for the delivery of such a service is clear.

Water fluoridation was first introduced in Ireland in 1964, following the Health (Fluoridation Supplies) Act, 1960. In compliance with the Act, a pre-fluoridation baseline National Survey of Children's Oral Health was carried out in every county in RoI between 1961 and 1963, and a post-fluoridation National Survey was carried out in 1984. The 1984 survey and local surveys carried out during the late '60s and early '70s showed that fluoridation of public water supplies was effective in preventing dental caries in Ireland. Results of the 1984 survey and of regional surveys carried out in the 1990s confirmed that caries levels had declined among those with non fluoridated as well as fluoridated domestic water supplies, but that the decline had been greater in the latter group. The results of this 2002 study will establish whether children residing in communities with water fluoridation continue to have lower levels of dental caries (decay) than those without. The study is also designed to identify the characteristics of children whose oral health needs are greatest.

A novel aspect of the project described in this report is that it is the first time the oral health of a representative sample of children north and south of the border has been measured contemporaneously, using standardised criteria. The cooperation of the Department of Health, Social Services and Public Safety in Northern Ireland (DHSSPSNI) made this approach feasible. As a result, it will be possible to compare the oral health of children and adolescents in RoI, where the water is mainly fluoridated, with that of the same age groups in Northern Ireland (NI), where the water supplies are not fluoridated. The system for delivery of children's oral health services is different in the two jurisdictions. The results will also indicate the impact of the two different approaches on the oral health treatment needs of children within the two systems.

This report is provided in hard copy. In addition, detailed results by health board region, as they were prior to the Health Act, 2004², and appendices are available on compact disc (CD). The report, detailed results by health board region, and appendices are accessible on the Department of Health and Children's website <http://www.dohc.ie>.

1.2 Aims of the survey

The protocol for the survey was developed by the project team in the Oral Health Services Research Centre (OHSRC) (Appendix 1) following widespread consultation with the Assistant Chief Executive Officers of the health boards, Principal Dental Surgeons, dental examiners for the survey, Irish Dental Council, council members of the Irish Dental Association, Dublin Dental Hospital, Irish Dental Health Foundation and the National Adult Literacy Agency. The staff of the Department of Health and Children and health boards had an important role in the planning and management of the survey.

This final report addresses the specific aims of the survey as set out in the protocol. These aims were:

- To measure levels of oral health in children and adolescents in Ireland in 2002, and to compare these data with local surveys conducted in the 1990s, national surveys conducted in 1984 and 1961–'63, and with data from international surveys.
- To provide a standardised up-to-date database on the oral health of children and adolescents in Ireland.
- To provide information on the oral health gain in children and adolescents since the last national and local surveys.

- To examine the relationship between water fluoridation and dental caries whilst controlling for age group, gender, behavioural aspects and medical card ownership.
- To assess oral health knowledge, attitudes and behaviour amongst children and adolescents, and to link these with oral health status.
- To assess the perceived availability, accessibility and acceptability of the oral health services to children, adolescents and parents.
- To compare the level of oral health of children attending schools designated 'special needs' by the Department of Education and Science with those of the general population (reported separately).
- To assess the perceived availability, accessibility and acceptability of the oral health services to children and adolescents with special needs and to their parents (reported separately).
- To provide information for the evaluation and future planning of oral health services in Ireland.
- To explore the relationship between medical card ownership and oral health.

1.3 Funding and support

For RoI, the Department of Health and Children and the health boards funded the survey as part of a contract for epidemiological services. The Oral Health Services Research Centre (OHSRC) in University College Cork won the contract to advise and assist the health boards in the design and conduct of the survey and to provide other epidemiological services, through a competitive tender process. The tender was originally advertised in the EU Journal in 1998, and the contract was awarded in July 1999. The extension of the fieldwork to NI resulted from discussions with the Chief Dental Officer and managers of the Community Dental Service in NI, who provided support for the extension of the survey.

The fieldwork for the survey was conducted by health board dentists and dental nurses (Appendix 2). As part of the process, staff at the Oral Health Services Research Centre trained 36 dentists and 36 dental nurses in survey methods and in the use of computers and computer software for the collection of survey data. Hence, development of new skills for health board staff was an integral part of the survey. Communication was ongoing between the fieldworkers and the OHSRC headquarters team throughout the fieldwork. The OHSRC provided advisory support for both the epidemiological and technical aspects of the data collection. A number of primary schools around the country assisted with the training and calibration of the examining dental teams. The Department of Education and Science provided data for the development of the sampling frame. A 'User Group' (Appendix 3) was established to represent the health boards in the planning, implementation, and monitoring of the surveys. This group provided the link between the dental service managers and the survey headquarters team. Regular meetings ensured clear communication between the two. The NI component of the survey was facilitated by members of the Community Dental Service and the DHSSPSNI (Appendix 4).

1.4 Ethical approval and data protection

The Ethics Committee of the Cork Teaching Hospitals reviewed the protocols for training and calibration of the examiners and for the main study. The Committee approved the study on 2nd October 2001. Ethical approval was also obtained from the Research Ethics Committee of Queen's University, Belfast for the NI component of the study.

The Office of the Data Protection Commissioner was consulted regarding the direct entry of data onto computers. The Data Protection Licenses of the health boards and of University College Cork were extended to include the survey data. The study complied with the requirements of the Data Protection Act 1988; Data Protection (Access Modification) (Health) Regulations, 1989 (S.I. No.82 of 1989); Data Protection (Access Modification) (Social Work) Regulations, 1989 (S.I. No.83 of 1989); Council Directive on the Protection of Individuals with Regard to Processing of Personal Data (Directive 95/46/EC)(W).

1.5 Sample

Children were selected randomly on the basis of age, gender, geographical location of the school attended, and whether they attended a school with a fluoridated or non fluoridated water supply. The groups chosen were children in Junior Infants, 2nd Class, 6th Class and Junior Certificate in RoI and Primary 1, Primary 4,

Year 1 and Year 4 in NI. The groups will be referred to as 5-, 8-, 12- and 15-year-olds within this report. These age groups are comparable with earlier Irish studies and with studies conducted internationally as they include those age groups recommended for study by the World Health Organisation (WHO). Selection of children on the basis of age is essential because dental caries is a cumulative condition, hence levels increase with age. The number and type of teeth present in the mouth also change with age. For example, children in Junior Infants / Primary 1 are, on average, 5-year-olds, have all their primary (deciduous, milk, or baby teeth), and no second or permanent teeth. Children in 2nd Class / Primary 4 (8-year-olds) have approximately 12 second or permanent teeth plus 12 primary teeth. By the time children are in 6th Class / Year 1 (12-year-olds), the teeth present in the mouth are mainly permanent ones. For Junior Certificate / Year 4 adolescents (15-year-olds), there are usually no primary teeth left, and they have their full complement of permanent teeth (except wisdom teeth).

The Department of Education and Science provided information on numbers of children in different classes in schools in RoI. This allowed the random selection of schools for inclusion in the survey. The primary sampling unit was the school. A cluster sampling technique was used with schools as the clustering unit. Schools were categorised according to health board region and size (to ensure representation of schools of various sizes) and whether they were located in a fluoridated or non fluoridated area. Within each Community Care Area, schools were randomly selected to ensure a balance for fluoridation status (where appropriate) and in proportion to the size of the school. A list of children in each class in each year (Junior Infants, 2nd class, 6th class and Junior Certificate) was obtained from the selected schools.

The Department of Education for NI provided information on numbers of children in different classes in schools in NI. This allowed the random selection of schools for inclusion in the survey. The primary sampling unit was the school. A cluster sampling technique was used with schools as the clustering unit. Schools were categorised according to geographical region, size and an income deprivation index assigned to each school (to allow comparison with RoI within socioeconomic status). Within each geographical region, schools were randomly selected in proportion to the size of the school. A list of children in each class in each year (Primary 1, Primary 4, Year 1 and Year 4) was obtained from the selected schools.

All children within a class were included in the random selection, irrespective of whether they had special needs, but teams were told not to include in the selection whole classes that were designated as special needs within a school. Schools designated 'special needs' by the Department of Education and Science were the subject of a separate survey of oral health conducted in 2003 (reported separately). The required number of children was selected randomly from each year and the consent forms were issued only to those children. In instances where there was a number of different classes within the one year (e.g., four different 2nd classes in the same school), a class was randomly selected and the children were randomly selected within this class. If insufficient numbers of children were present in the first class selected, another class was randomly selected until the required number of children to issue consent forms to was obtained.

The total target sample size required in RoI was 14,400. The sample size was based on the desire to have 120 children per cell in each of the four age groups in 30 Community Care Areas (120 X 4 age groups X 30 Community Care Areas = 14,400). The cell size of 120 would allow reliable estimates of dmft/DMFT by fluoridation or disadvantage (medical card) status. The total sample size had sufficient power to demonstrate a difference in dmft/DMFT levels of at least 0.5 in 5-, 12- and 15-year-olds and at least 0.2 in 8-year-olds, between children from fluoridated and non fluoridated areas in RoI. The target sample size of 2,390 in NI was chosen to demonstrate the same differences in dmft/DMFT (in each age group) between NI (non fluoridated) children and adolescents and those in fluoridated areas in RoI according to socioeconomic status.

1.6 Training and calibration of the examining teams

Before commencing the fieldwork, the teams of dentists and dental nurses were trained and calibrated in standardised methodology to ensure inter- and intra- examiner reliability on the measurement indices used. Thirty-two teams from RoI and four teams from NI conducted the fieldwork for the survey. Training took place in groups of 10 teams. Initially for RoI teams, three training courses were conducted in June 2001 in two schools in Cork: Scoil Aiseirí Chríost, Farranree and Scoil Oilibheir Primary School, Ballyvolane. Further training and the final calibration of the RoI teams took place in September 2001 in three schools: Scoil Mhuire Primary School, Tullamore, Co. Offaly; St. Philomena's National School, Bray, Co. Wicklow; and Scoil Aiseirí Chríost, Farranree, Cork City (three of the four teams from NI were trained and calibrated with eight of the RoI teams in Cork in September 2001). An additional team was recruited from NI and trained in Cork in January 2002 to assist in the fieldwork. The principal trainer was involved in the training of the examiners in the 1984 National Survey in RoI and also trained the teams for the subsequent regional surveys in the 1990s. She was assisted by four assistant trainers who were experienced in the survey examination criteria (Appendix 5a). The level of agreement between the examiners and the gold standards in the various indices was calculated and measures of agreement were generated. Additional calibration exercises took place during the training courses between the trainers and the principal examiner to monitor and ensure standardization among the trainers in the training programme.

In December 2002, six examiners from RoI were recalled for further training in Dean's Index, and one examiner in the Dental Health Component of the modified IOTN Index. A further validation exercise was conducted during the fieldwork to monitor examiner agreement and consistency during the course of the survey. Training and calibration of the examiners from the participating health boards in the photographic recording of dental fluorosis took place in two separate training courses in October 2001 and January 2002 (Appendix 5b). During the training sessions, the teams were trained in the use of direct data entry onto laptop computers using software written for the survey (Appendix 6a). Systematic instructions on the return of data electronically were also given.

1.7 Clinical examination

The methods and indices used in this study of oral health facilitate the comparison of the results with other national and international surveys. The criteria and indices used are detailed within the report. The children were examined in their schools. Lighting was provided by a portable dental light source ('Daray' lamp). A strict cross infection protocol was followed. Children lay in the supine position for the caries examination. The teeth were examined with a dental mirror and a probe with a 0.5mm ball tip. The teeth were not dried for the dental examination, the mouth was illuminated using a portable dental light source and no radiographs were taken.

1.8 The fieldwork

The Department of Education and Science and the Irish Dental Association were notified of the survey, following which the examining teams were given details of the schools. The fieldwork was conducted between October 2001 and June 2002. For schools selected in the sample, the examiners contacted the chairpersons of school boards of management and the school principals. They were informed of the nature and aims of the study and were invited to participate. When agreement was received, the examining teams contacted the schools and the required number of children was randomly selected according to software developed for the purpose (Appendix 6b). Consent forms, which complied with the requirement for informed consent and included details of the survey procedures, were issued to the selected children. The children were asked to give the forms to their parents or guardians for completion. Parents or guardians were asked to indicate whether they were in possession of a medical card (MC) in RoI, or whether they were in receipt of low income benefits (LIB) in NI. The consent forms also included questions on the water supply to the child's current and any previous home. This information was used to determine the child's lifetime exposure to domestic water fluoridation. Children were asked to return the completed forms to school. The right of children to refuse examination was observed and the teams did not attempt to proceed to examine children who refused examination.

1.9 Response rate

The overall response rate for RoI was 68% (68%, 68%, 68% and 66% in the 5-, 8-, 12- and 15-year-old age groups, respectively). The overall response rate for NI was 53% (56%, 63%, 59% and 43% respectively).

1.10 Statistical analysis

The data were exported from the direct entry software as an ASCII type II file and imported to the SAS® statistical package (version 9.1) for analysis. Health board and national results have been weighted according to the relative population sizes of the community care areas, which made up the health board regions. The NI results were not weighted, as the population sizes were available by geographical region and not by board.

1.11 Format of the report

This report has eight chapters. Chapter 1 describes the background to and design of the survey. It also describes the number of children and adolescents examined and the average age of the children in the four school years included in the study. Chapter 2 gives a detailed description of the level and distribution of dental caries. This is followed by an account of the levels of enamel opacities and dental fluorosis among the sample in Chapter 3. Data on oral hygiene, orthodontic treatment need, dental trauma and tooth wear are analysed in Chapters 4, 5, 6 and 7, respectively. Responses to the questionnaires and their relation to dental caries levels are presented in Chapter 8 along with the results of Generalised Linear Models to identify which of the relevant variables collected in the survey were associated with the distribution of dental caries of 8- and 15-year-olds in RoI and NI. Throughout the report, data are presented according to health board region of residence, fluoridation status and disadvantage status. Data are also presented for RoI as a whole and for NI.

To fulfill the main aims of the study, statistical comparisons are presented for selected results for RoI as a whole and for NI. It would be inappropriate to conduct multiple statistical comparisons at health board level, as the study was not powered to conduct comparisons at this level. Both univariate and multivariate statistics are used in this report. Univariate comparisons use two sided, 2 sample t-tests and chi-squared tests with a 5% level of significance. Multivariate methods used are Generalised Linear Models for a negative binomial distribution and a logarithmic link function, and Logistic Regression.

1.12 Abbreviations

The following abbreviations are used in the tables:

To denote the jurisdiction or region being presented

ERHA	Eastern Regional Health Authority (formally known as the EHB: Eastern Health Board).
ECAHB	East Coast Area Health Board (sub-region of ERHA)
NAHB	Northern Area Health Board (sub-region of ERHA)
SWAHB	South Western Area Health Board (sub-region of ERHA)
MHB	Midland Health Board
MWHB	Mid Western Health Board
NEHB	North Eastern Health Board
NWHB	North Western Health Board
SEHB	South Eastern Health Board
SHB	Southern Health Board
WHB	Western Health Board
RoI	Republic of Ireland
NI	Northern Ireland

To denote fluoridation status

Full FI	Fully fluoridated
Non FI	Non fluoridated

To denote disadvantage status

MC	Medical Card Holder (surrogate for less well off, or disadvantaged, in RoI)
LIB	Low Income Benefits (surrogate for less well off, or disadvantaged, in NI)

1.13 Number of children examined

A stratified representative sample of 5-, 8-, 12- and 15-year-old children and adolescents in each of the 10 health board regions in RoI, and in NI was selected to participate in the study. In RoI, the dental teams examined 17,851 children and adolescents (Table 1.1). Over 3,000 children and adolescents were examined in each of the 8-, 12- and 15-year-old groups, and over 6,000 children in the 5-year-old group. The high numbers in the 5-year-old group resulted from a request by the NEHB to do a population survey of the 5-year-old group in that area. In NI, 2,112 children and adolescents were examined

(Table 1.1).

An even gender balance was achieved in the sample: 50% male in Rol (Figure 1.1) and 49% male in NI (Figure 1.2).

Figure 1.1 Gender distribution within RI sample

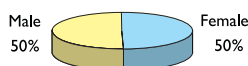


Figure 1.2 Gender distribution within NI sample

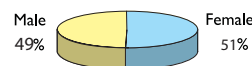


Table 1.1 Number of children examined in each of the health board areas in Rol and in NI for the National Survey of Children’s Dental Health 2001/2002

	Age Group				Total
	5	8	12	15	
ERHA	804	933	855	894	3486
ERHA - ECAHB	227	248	217	230	922
ERHA - NAHB	272	356	325	335	1288
ERHA - SWAHB	305	329	313	329	1276
MHB	306	276	337	260	1179
MWHB	382	402	413	350	1547
NEHB	3308	374	363	346	4391
NWHB	270	242	268	263	1043
SEHB	551	547	592	495	2185
SHB	658	652	698	622	2630
WHB	378	350	357	305	1390
Total Rol	6657	3776	3883	3535	17851
Total NI	830	303	346	633	2112

1.14 Fluoridation status of the children examined

As a result of the Health (Fluoridation of Water Supplies) Act 1960, 71% of the population in Rol now has fluoridated domestic water supplies.

Although the sample was selected on the basis of school water fluoridation status, the results are presented according to each child’s domestic water fluoridation status. Information on the water supply and on fluoride supplements was requested on the consent form. The child’s name and home address was entered on the consent form, and the parent was asked whether the home was connected to the piped public water supply. The parent was also asked how long they had lived at the address and about any previous addresses. The consent form also contained questions about fluoride mouthrinses and supplements.

Fluoridation status was classified for each child after the clinical examinations. For residences connected to the piped public water supply, information on the fluoride status of the supply was obtained from the local water engineer on an individual address basis when necessary.

Fluoridation status was classified as follows:

Not recorded: There was insufficient information on the record to determine the fluoridation status of the domestic water supply.

Full: The child had a fluoridated domestic water supply in the home since birth.

Non: The child had no exposure to fluoridated water in the home since birth and had never used fluoride mouthrinses or supplements.

Part: The child had fluoridated water in the home (but not continuously since birth).

Rinse only: The child's home address had never had a fluoridated water supply but the parent reported that the child had taken a fluoride mouthrinse, or participated in a school fluoride mouthrinse scheme.

Mixed fluoride supplements: Children in this group had reported taking fluoride supplements and may also have used fluoride mouthrinse.

The fluoridation supply of the school was not factored into this categorization; hence children whose home water supply was not fluoridated may have attended a school with a fluoridated water supply.

Schools attended by 15-year-olds tend to be located in large towns, most of which have fluoridated water supplies. As with the other age groups, the 15-year-old samples were drawn from the schools and fluoridation status of each adolescent was determined post hoc by referring to the water supply of the home address/es as provided on the completed consent form. A tally of numbers in the 'Full' and 'Non' fluoride groups was maintained as the survey progressed. A top up sample was drawn where cell sizes were insufficient or likely to be insufficient.

The distribution of the sample according to these fluoridation categories is shown in Table 1.2 and Figure 1.3 for RoI, and Table 1.2 and Figure 1.4 for NI.

In this report, where results are presented according to fluoridation status, data are presented for the 'fully fluoridated' and 'non fluoridated' groups only. This is because the other groups generally contained only small numbers of subjects.

Table 1.2 Distribution of children examined in RoI and NI according to the fluoridation status of their domestic water supply

RoI	Age Group				All
	5	8	12	15	
Fluoridation status					
Not recorded	170	41	33	42	286
Full	3614	2211	2089	2062	9976
Non	2159	816	746	632	4353
Part	668	363	367	343	1741
Rinse only	26	315	586	389	1316
Mixed fl supp	20	30	62	67	179
Total	6657	3776	3883	3535	17851

NI	Age Group				All
	5	8	12	15	
Fluoridation status					
Not recorded	7	2	0	3	12
Full	1	11	0	1	13
Non	668	210	201	396	1475
Part	2	1	7	3	13
Rinse only	16	15	7	28	66
Mixed fl supp	136	64	131	202	533
Total	830	303	346	633	2112

Figure 1.3 Percentage distribution of RoI sample according to fluoridation status

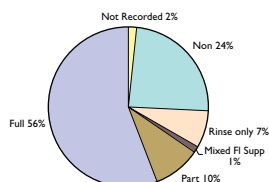
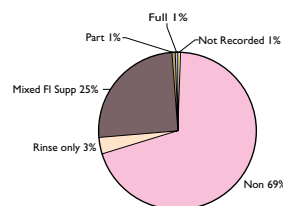


Figure 1.4 Percentage distribution of NI sample according to fluoridation status



1.15 Levels of disadvantage among the sample

One of the major objectives of health services is to ensure equitable delivery of care to all groups. The sample was monitored to ensure adequate representation of the less well off. Medical card ownership by the parents or guardians of the children and adolescents in the sample was used as a surrogate for disadvantage in Rol. Parents were asked, on the consent form, to indicate whether they had a medical card. For the general population under age 70 in Rol, medical card issue is based on a means test unless the applicant has a disability. Medical cards are issued to low income applicants. In NI, disadvantage was classified according to whether the parents or guardians of the children or adolescents in the sample were in receipt of any low income benefits. The numbers of children examined in both jurisdictions whose families were classified in this way are shown according to fluoridation status in Table 1.3.

Twenty four percent of the total sample examined in Rol had medical cards. This figure is likely to be similar to the proportion of children in the entire population who are dependants of medical card holders as the General Medical Service (Payments) Board (GMS(P)B) estimated that in 2001 31% of the entire population of Rol was eligible for medical card benefits³. In NI, 38% of the sample was in receipt of low income benefits. This difference in the percentage of the sample classified as disadvantaged in Rol and in NI arises because of the use of different measures of disadvantage in the two regions. A measure of disadvantage applicable in the two regions would be useful, however none was available for this study and NI/Rol comparisons according to disadvantage must bear this difference in mind.

Table 1.3 Distribution of children examined in Rol and NI according to their level of disadvantage as classified by their parents' ownership of a medical card (MC, MC = less well off, Rol) or receipt of low income benefits (LIB, LIB = less well off, NI) within age group and fluoridation status

Region	FI Status		Age Group									
			5		8		12		15		Total	
			n	%	n	%	n	%	n	%	n	%
Rol	Full FI	MC Yes	945	26	542	25	469	22	561	27	2517	25
		MC No	2659	74	1656	75	1618	77	1493	72	7426	74
	Non FI	MC Yes	380	18	157	19	170	23	175	28	882	20
		MC No	1769	82	656	80	575	77	456	72	3456	79
	TOTAL	MC Yes	1550	23	875	23	895	23	959	27	4279	24
		MC No	5050	76	2863	76	2973	77	2554	72	13440	75
NI	Non FI	LIB Yes	258	39	87	41	76	38	129	33	550	37
		LIB No	407	61	119	57	117	58	261	66	904	61
	TOTAL	LIB Yes	326	39	136	45	127	37	212	33	801	38
		LIB No	495	60	161	53	207	60	406	64	1269	60

I.16 Age of the children and adolescents examined in the survey

Children in Junior Infants, 2nd and 6th class and Junior Certificate year comprised the sampling frame in Rol. In NI, the sampling frame consisted of children in Primary 1, Primary 4, Year 1 and Year 4.

The children are referred to as 5-, 8-, 12- and 15-year-olds throughout the report. Each child's actual age on the date of examination was recorded. The mean age of the children examined in the different classes are presented in Table I.4. As many oral conditions are cumulative and increase with age, it is important to ensure that the mean ages of the children in groups under comparison are similar. The mean ages of the children grouped according to gender, fluoridation status and disadvantage were comparable (Table I.4), the widest discrepancy within an age grouping being 0.3 years.

Table I.4 Mean age according to gender, fluoridation status and disadvantage as indicated by family ownership of a medical card (MC, Rol) or low income benefits (LIB,NI) of children and adolescents examined in Rol and NI

		Age Group			
		5	8	12	15
Rol	Female	5.3	8.3	12.3	15.1
	Male	5.4	8.4	12.4	15.2
NI	Female	5.4	8.4	12.2	15.2
	Male	5.4	8.3	12.2	15.2
Rol	Full FI	5.3	8.4	12.4	15.1
	Non FI	5.4	8.4	12.4	15.2
NI	Non FI	5.4	8.4	12.2	15.2
Rol	MC Yes	5.3	8.4	12.5	15.2
	MC No	5.4	8.4	12.4	15.2
NI	LIB Yes	5.4	8.3	12.2	15.2
	LIB No	5.4	8.4	12.2	15.2
Rol	Total	5.3	8.4	12.4	15.2
NI	Total	5.4	8.3	12.2	15.2

REFERENCES:

- 1 Department of Health and Children (2001): Quality and Fairness: A Health System for You. Health Strategy. Stationery Office, Dublin, 2001.
- 2 Government of Ireland (2004): Health Act, 2004. Stationery Office, Dublin.
- 3 General Medical Services Payments Board (2002): Financial and Statistical Analysis of Claims and Payments, 2001.

Chapter 2

Dental Caries

2.1 Summary

- For the 5-, 12- and 15-year-old age groups, dental caries levels were lower amongst children with lifetime exposure to fluoridated domestic water supplies than those residing in non fluoridated areas.
- Comparing children and adolescents with domestic water fluoridation in the Republic of Ireland (RoI) with those in non fluoridated Northern Ireland (NI), caries levels were 43.5% lower among 5-year-olds, 33.3% lower among 12-year-olds and 39.5% lower among 15-year-olds in RoI.
- The proportion of 5-year-olds in RoI with caries in their primary teeth had fallen from 48% in 1984 to 36.9% in 2002 in fluoridated areas, and from 62% in 1984 to 54.5% in 2002 in non fluoridated areas. In non fluoridated NI in 2002, 54.9% of 5-year-olds had caries in their primary teeth.
- For 15-year-olds in RoI, the percentage with caries in their permanent teeth had fallen from 88% in 1984 to 73.0% in 2002 in fluoridated areas, and from 92% in 1984 to 79.3% in 2002 in non fluoridated areas. In non fluoridated NI, 81.1% of 15-year-olds had caries.
- Most of the decay in 5-year-olds is untreated (%d); over half of the decay in 8-year-olds and one third in 12-year-olds is untreated (%D). For 15-year-olds, approximately one third of decay is untreated in RoI and one quarter in NI.
- Decay levels are higher amongst the less well off in both RoI and NI.
- Fissure sealants were present on some of the teeth of 70.4% of 12-year-olds in RoI and 54.9% of 12-year-olds in NI. Fewer fissure sealants were found on the teeth of the less well off.
- Caries levels in RoI have not improved as much as those in the UK in the last two decades: caries levels in fluoridated areas in 1984 were lower than those in the UK; in 2002 they were higher for 8-, 12- and 15-year-olds.

2.2 Dental caries – measurement

Children were examined for tooth decay, which had extended through the tooth enamel and into dentine. Tooth decay levels in children are best described using a measurement called the DMFT index. This measurement counts the number of teeth which are decayed (D), missing (i.e. extracted due to decay) (M), or filled due to decay (F). Data for 5-year-old children refer to primary teeth only, and by convention are referred to by lower case letters (dmft). The figures for 8-, 12- and 15-year-olds refer to permanent teeth only, and are referred to by upper case letters (DMFT).

World Health Organisation (WHO) examination criteria were used in RoI in the current survey and in the national survey carried out in 1984. In the 1960s the criteria used were similar to both the current WHO criteria and to the criteria used in the UK up to the 1990s. These criteria dictate that only dental caries at cavitation level should be recorded. That is, it must be possible to confirm a cavitation to dentine by placing a probe in the cavity. The notation for this type of cavitated caries is $d_{3c}mft$ for primary teeth and $D_{3c}MFT$ for permanent teeth (WHO criteria¹) - the '3' indicates that caries is recorded at the dentinal level of involvement and the 'c' indicates that the lesion has cavitated. A ball tipped CPITN probe was used to remove plaque and to help confirm diagnosis of cavitation. The mean $D_{3c}MFT$ for 15-year-olds in fully fluoridated areas is reported as 2.1, this indicates that, on average, 15-year-olds in these areas have 2.1 permanent teeth that are decayed (with cavities), missing due to decay, or filled. Another way of looking at it is to say that among every 1,000 15-year-olds there are an estimated 2,100 teeth affected by dental caries at cavitation level. Some of these teeth may be decayed but untreated, they may have been restored (filled), or they may have been extracted (missing). Similarly, in non fluoridated areas the mean $D_{3c}MFT$ for 15-year-olds is 3.2, indicating that among every 1,000 15-year-olds living in non fluoridated areas there are an estimated 3,200 permanent teeth which are decayed (cavitated), missing or filled. These criteria allow historical comparison with surveys in RoI conducted in the 1960s, 1984 and 1990s.

It has always been acknowledged that indices for caries record a stage of the disease rather than the absolute presence or absence of the disease. It was decided that cavitation level was a stage at which examiner calibration and reproducibility could be easily achieved. In recent years, the reduction in the prevalence of the disease and the greater availability and accessibility of treatment services has had an impact on the value of this method of measurement. Non cavitated dentinal caries, where the caries is visible as a shadow under the enamel, was previously ignored in many systems for recording caries and, as a result, not recorded in the dmft/DMFT index. It was measured in the treatment need as recorded using WHO criteria, but not in the reported figures for caries levels. However, if a child or adolescent with visual caries had a course of dental treatment, the visual caries would have been filled thus increasing the 'F' component of the DMFT. This filling would then have been counted in the dmft/DMFT index. Hence, as caries levels have fallen, and access to treatment has increased, the impact of the exclusion of visible, but not cavitated, dentinal caries is likely to be expressed as an apparently higher dmft/DMFT score in areas with easily accessible services and a lower dmft/DMFT score in areas with less access to services. Accordingly, the British Association for the Study of Community Dentistry amended its criteria in the 1990s, and now includes dentinal caries which is visible underneath the enamel but which does not have a detectable cavity through the enamel in its dmft/DMFT count. The notation for this level of recording is d_{3vc} mft for primary teeth, and D_{3vc} MFT for permanent teeth, the addition of the letter 'v' indicating the inclusion of visible non cavitated dentinal caries.

Thus, in this survey, caries was recorded at the dentinal level of involvement using WHO (WHO, 1987¹) criteria. The criteria were expanded to include coding for visible non cavitated dentinal caries. The coding system thus allowed for analysis of the data for caries at the dentinal level of involvement with or without cavitation. This approach allows the data to be analysed either without visual caries d_{3c} mft/ D_{3c} MFT (historical method used in earlier surveys) or with visual caries d_{3vc} mft/ D_{3vc} MFT (method currently used in UK and NI²).

Caries recorded at the d_{3vc} mft/ D_{3vc} MFT (visual level) provides more information about disease levels. Hence, except for historical comparisons, all data in the report will be presented at this level. In this report, the term 'cavitated' will be used to describe caries at the d_{3c} mft/ D_{3c} MFT level, and the term 'visual' to describe caries at the d_{3vc} mft/ D_{3vc} MFT level.

2.3 Caries levels according to fluoridation status

One of the main aims of this survey was to measure the impact of fluoridation on the oral health of children. Of the total population of 3.8 million in RoI, 71% reside in fluoridated communities. In NI, public water supplies are not fluoridated. Accordingly, levels of dental caries among children in RoI and NI in 2002 are reported by fluoridation status for those who have had fluoridated water in the home since birth (fluoridated), and for those who have never had access to fluoridated water in the home (non fluoridated). Top line data are presented for each health board in RoI - the three Eastern Regional Health Authority (ERHA) boards: East Coast Area Health Board (ECAHB), Northern Area Health Board (NAHB), South Western Area Health Board (SWAHB); ERHA as a whole; Midland Health Board (MHB); Mid Western Health Board (MWHB); North Eastern Health Board (NEHB); North Western Health Board (NWHB); South Eastern Health Board (SEHB); Southern Health Board (SHB); Western Health Board (WHB); for RoI and for NI.

The number of households without water fluoridation in the ERHA region is very small, hence data are not presented for the non fluoridated ('non fl') category for ERHA. In the WHB region, school-based fluoride mouthrinse schemes are very common. As a result, the numbers in the non fluoridated 12- and 15-year-old groups were too small to allow presentation of meaningful data.

NI does not have community water fluoridation; therefore caries data for NI are confined to the tables showing figures for non fluoridated groups.

Differences in dental caries according to fluoridation status are presented for all teeth, all surfaces, anterior and posterior teeth separately, and for pit and fissure and smooth surfaces separately.

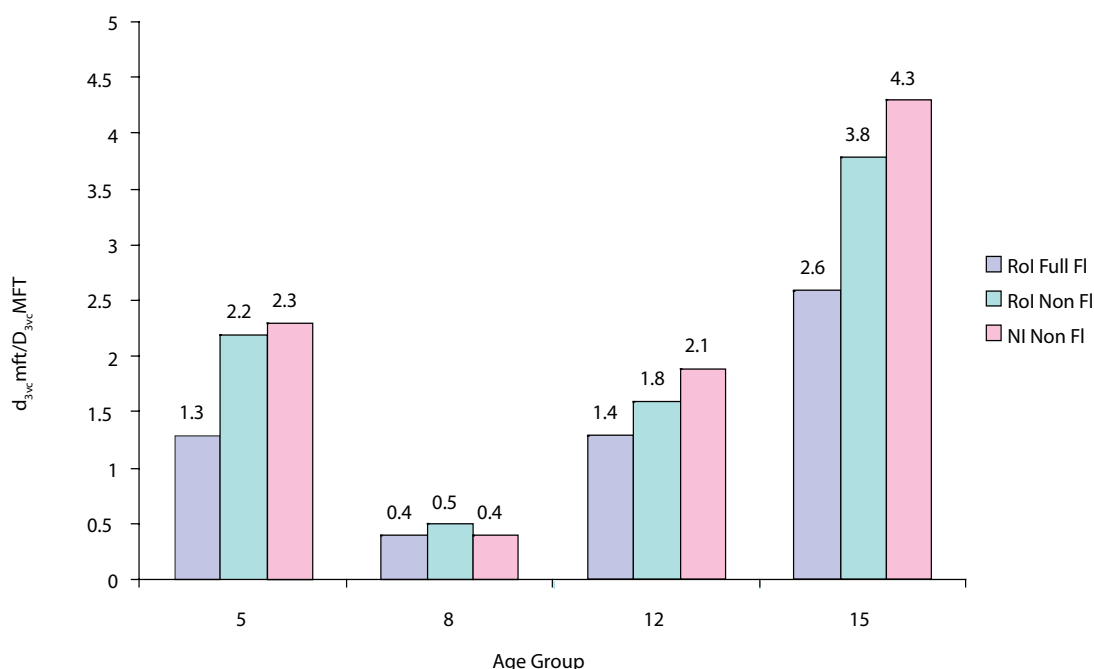
The percentage frequency distribution of decayed, missing and filled teeth is shown according to fluoridation status. Building on this theme, the mean caries experience of children and adolescents whose caries experience score is in the highest one third of caries levels is contrasted with the mean caries experience score of the rest of the sample (Significant Caries Index³).

The level of dental caries among children and adolescents in RoI and NI in 2002 is shown in Table 2.1 and Figure 2.1.

Table 2.1 Mean d_{3vc} mft (5-year-olds), D_{3vc} MFT (8-, 12- and 15-year-olds) and standard deviations (sd) for children and adolescents in RoI and NI by age group and fluoridation status

Age Group	Full FI RoI		Non FI RoI		Non FI NI	
	d_{3vc} mft / D_{3vc} MFT	sd	d_{3vc} mft / D_{3vc} MFT	sd	d_{3vc} mft / D_{3vc} MFT	sd
5	1.3	2.3	2.2	2.3	2.3	3.2
8	0.4	0.9	0.5	0.9	0.4	0.8
12	1.4	1.9	1.8	2.1	2.1	2.2
15	2.6	2.6	3.8	3.4	4.3	3.7

Figure 2.1 Mean d_{3vc} mft (5-year-olds), D_{3vc} MFT (8-, 12- and 15-year-olds) for children and adolescents in RoI and NI by age group and fluoridation status



In RoI as a whole, 5-year-old children residing in areas with full domestic water fluoridation had, on average, 1.3 decayed, missing or filled primary or milk teeth (mean d_{3vc} mft). For 8-, 12- and 15-year-olds with full domestic water fluoridation, the corresponding figures for permanent teeth were 0.4, 1.4 and 2.6 respectively (mean D_{3vc} MFT). As children grow older, their caries levels tend to increase as the number of permanent teeth in the mouth increases and the teeth are exposed to cariogenic (decay producing) foods over longer time periods. In non fluoridated areas, the pattern is similar but with higher levels of caries at all ages. On average, 5-year-olds in non fluoridated areas had 2.2 decayed, missing or filled primary teeth, while 8-, 12- and 15-year-olds had, on average, 0.5, 1.8 and 3.8 permanent teeth respectively affected by caries. The mean d_{3vc} mft/ D_{3vc} MFT scores for 5-, 8-, 12- and 15-year-olds in NI were 2.3, 0.4, 2.1 and 4.3 respectively. For the 5-, 12- and 15-year-old age groups, dental caries levels were lower amongst children with lifetime exposure to fluoridated domestic water supplies than amongst children with no exposure. The difference in dental caries levels due to fluoridation was tested in a multivariate analysis to control for confounding due to disadvantage; this analysis is presented later in the chapter.

Table 2.2 Mean number of decayed, missing and filled teeth (t/T) and surfaces (s/S) in 5-year-olds (d_{3vc} mft and d_{3vc} mfs), 8-, 12- and 15-year-olds (D_{3vc} MFT and D_{3vc} MFS) in Rol and NI by age group, fluoridation status and health board

Health Board	Age 5				Age 8				Age 12				Age 15			
	Full FI		Non FI		Full FI		Non FI		Full FI		Non FI		Full FI		Non FI	
	t	s	t	s	T	S	T	S	T	S	T	S	T	S	T	S
ERHA	1.0	2.2			0.4	0.5			1.2	1.8			2.5	3.8		
ERHA-ECAHB	0.8	1.7			0.3	0.4			1.0	1.5			2.4	3.6		
ERHA-NAHB	1.2	2.5			0.4	0.6			1.3	2.1			2.5	4.0		
ERHA-SWAHB	1.0	2.2			0.4	0.6			1.2	1.7			2.6	3.9		
MHB	1.7	3.5	2.1	4.9	0.4	0.8	0.4	0.6	1.2	1.9	1.6	2.5	2.6	4.0	2.8	4.2
MWHB	1.8	4.1	2.2	4.6	0.5	0.6	0.6	0.8	1.9	3.0	1.9	2.7	2.2	3.5	4.1	6.7
NEHB	1.4	2.9	2.1	4.4	0.6	1.1	0.4	0.6	1.6	2.7	1.7	2.8	2.8	4.4	3.4	5.4
NWHB	2.0	4.5	2.6	5.6	0.4	0.6	0.6	0.8	2.1	3.3	2.1	3.0	3.1	5.1	4.0	7.5
SEHB	2.0	4.5	2.1	4.5	0.5	0.8	0.4	0.5	1.6	2.3	1.9	3.0	2.8	4.7	3.3	5.1
SHB	1.1	2.3	2.0	4.2	0.3	0.4	0.5	0.8	1.3	1.9	1.9	3.1	2.6	4.2	3.4	5.9
WHB	1.2	2.3	2.4	4.4	0.3	0.4	0.3	0.4	1.7	2.4			2.5	3.8		
Rol	1.3	2.8	2.2	4.7	0.4	0.6	0.5	0.7	1.4	2.2	1.8	2.9	2.6	4.1	3.8	6.4
NI			2.3	5.3			0.4	0.5			2.1	3.4			4.3	7.4

Table 2.2 shows the d_{3vc} mft/ D_{3vc} MFT and d_{3vc} mfs/ D_{3vc} MFS data according to fluoridation status within each of the ten former health board regions for all four age groups. There was considerable regional variation in dental caries levels.

The mean d_{3vc} mft levels among 5-year-olds in fluoridated areas ranged from 0.8 to 2.0. They were lowest (mean d_{3vc} mft 0.8) in the ECAHB region of ERHA, and were highest in the SEHB region and the NWHB regions (mean d_{3vc} mft 2.0). For non fluoridated 5-year-old groups, the range of mean d_{3vc} mft was 2.0 to 2.6, with the lowest levels in the SHB region and the highest in the NWHB region. Mean caries levels among 5-year-olds in NI (mean d_{3vc} mft 2.3) were higher than those in all the fluoridated areas in Rol and were similar to those in non fluoridated areas in Rol. Overall, caries levels were 43.5% lower among 5-year-olds in Rol with water fluoridation than those in non fluoridated NI.

Caries levels in the permanent teeth of 8-year-old children were very low in both fluoridated and non fluoridated groups (mean D_{3vc} MFT range 0.3 to 0.6), with little difference between them and NI (mean D_{3vc} MFT 0.4).

The ECAHB region had the lowest caries levels (mean D_{3vc} MFT 1.0) in the 12-year-old fluoridated group and the NWHB region had the highest (mean D_{3vc} MFT 2.1). Interestingly, as with the 5-year-old group, there was a wide range in the percentage differences between D_{3vc} MFT scores of 12-year-old children in fluoridated and in non fluoridated groups. There was no difference according to fluoridation status in the mean D_{3vc} MFT among 12-year-old children in the NWHB area and the MWHB area. However, mean D_{3vc} MFT levels were 31.6% lower among 12-year-old children in the fluoridated group in the SHB region when compared with D_{3vc} MFT scores of children in the non fluoridated group in the same region. Overall, caries levels were 33.3% lower among 12-year-olds in Rol with water fluoridation than those in non fluoridated NI.

The mean caries scores in Rol ranged from 2.2 to 3.1 among 15-year-olds with fluoridated water supplies in the 10 health board regions. In contrast to the younger age groups, there was wider variation amongst health board regions in the mean D_{3vc} MFT scores amongst the 15-year-old non fluoridated groups (2.8 to 4.1) in Rol. The range in differences between fluoridated and non fluoridated groups was from 7.1% in the MHB region to 46.3% in the MWHB region. Caries levels among 15-year-

olds with water fluoridation in RoI were 39.5% lower than those for the same age group with no water fluoridation in NI.

Identification of the source of the variation amongst the health board regions in the apparent effectiveness of water fluoridation could facilitate optimisation of the fluoridation of water supplies in all regions. Monitoring of the various fluoridation schemes to assess the quality of the process in different regions is currently underway. The findings of that work may shed light on the source of this variation.

2.4 Decayed, missing and filled teeth and percent untreated

Whilst mean d_{3vc} mft/ D_{3vc} MFT scores indicate the level of caries in health boards or jurisdictions according to fluoridation status, examination of the makeup of these scores reveals information about the treatment of the disease. For example, a high m/M component is undesirable as it means that the teeth were lost due to caries; progressive tooth loss compromises the function of the dentition. A high d/D component indicates a need for treatment for caries; if neglected for too long, the only option may be extraction. A high f/F component suggests that although the disease is prevalent, it has been successfully treated.

Untreated decayed teeth (d_{3vc} t) were very common among 5-year-olds (Table 2.3a). In the fluoridated group in RoI, there were, on average, 1.1 untreated decayed teeth per child compared to 1.8 in the non fluoridated group and 1.7 in non fluoridated NI. These figures represented 82.6%, 83.1% and 74.0% of the d_{3vc} mft in the three groups respectively. Correspondingly, the mean number of missing teeth was low, although it was higher than the mean number of primary teeth filled due to caries in the three groups: 'Full FI' and 'Non FI' RoI and 'Non FI' NI. Thus, extraction is the most common treatment for caries in primary teeth among 5-year-olds in Ireland. Early loss of primary teeth is undesirable as it can cause misalignment of the succeeding permanent dentition.

Amongst the health board regions, the mean number of missing teeth was highest (0.4) in the non fluoridated group in the NWHB region, and lowest (0.0) in the fully fluoridated group in the ECAHB area of the ERHA and in the WHB region.

Table 2.3a Mean number of decayed (d_{3vc} t), missing (mt) and filled (ft) teeth, total caries experience recorded and proportion of caries recorded as untreated d_{3vc} t/ d_{3vc} mft x 100 (% d_{3vc} t) among 5-year-old children in RoI and NI by fluoridation status

Health Board	5-year-olds							
	Full FI				Non FI			
	d_{3vc} t	mt	ft	% untreated (% d_{3vc} t)	d_{3vc} t	mt	ft	% untreated (% d_{3vc} t)
ERHA	0.8	0.2	0.1	80.4				
ERHA-ECAHB	0.7	0.0	0.1	84.3				
ERHA-NAHB	1.0	0.2	0.0	85.8				
ERHA-SWAHB	0.7	0.2	0.0	74.5				
MHB	1.6	0.1	0.0	92.9	1.8	0.2	0.1	86.3
MWHB	1.4	0.2	0.2	78.8	1.8	0.2	0.3	80.4
NEHB	1.2	0.2	0.1	85.3	1.7	0.3	0.1	84.1
NWHB	1.7	0.3	0.0	86.7	2.2	0.4	0.0	84.9
SEHB	1.6	0.3	0.1	80.8	1.8	0.1	0.2	86.0
SHB	0.8	0.1	0.1	80.0	1.5	0.2	0.3	75.9
WHB	1.1	0.0	0.1	92.4	2.3	0.1	0.1	93.4
RoI	1.1	0.2	0.1	82.6	1.8	0.3	0.1	83.1
NI					1.7	0.4	0.2	74.0

On average, for every ten 8-year-olds there were two untreated decayed teeth in fluoridated Rol and in non fluoridated NI (mean $D_{3vc}T = 0.2$) (Table 2.3b). The level of untreated decay was higher at three in every ten teeth (mean $D_{3vc}T = 0.3$) among children in non fluoridated Rol. Missing teeth were uncommon in all three fluoridation groups. The mean number of filled teeth was 0.1 in fluoridated Rol and 0.2 in both non fluoridated Rol and in non fluoridated NI. Overall, in the three groups, over 50% of the caries was untreated in 8-year-olds (56.4% to 59.2%). This age group is one of the target groups for services in the Public Dental Service in Rol. Although many within this age group would have been treated in the months prior to the fieldwork, many more would have been treated in the months immediately after the fieldwork. Thus, there is wide variation in the percentage of untreated decay ($\% D_{3vc}T$) amongst the health board regions, ranging from 25.9% in non fluoridated WHB to 87.3% (non fluoridated) and 93.0% (fluoridated) in the NWHB region, where there is difficulty in filling the full compliment of posts in the Public Dental Service.

Table 2.3b Mean number of decayed ($D_{3vc}T$), missing (MT) and filled (FT) teeth, total caries experience recorded and proportion of caries recorded as untreated $D_{3vc}T/D_{3vc}MFT \times 100 (\%D_{3vc}T)$, among 8-year-old children in Rol and NI by fluoridation status

Health Board	8-year-olds							
	Full FI				Non FI			
	$D_{3vc}T$	MT	FT	% untreated ($\% D_{3vc}T$)	$D_{3vc}T$	MT	FT	% untreated ($\% D_{3vc}T$)
ERHA	0.2	0.0	0.1	66.7				
ERHA-ECAHB	0.2	0.0	0.1	57.1				
ERHA-NAHB	0.3	0.0	0.1	76.2				
ERHA-SWAHB	0.2	0.0	0.1	60.0				
MHB	0.3	0.0	0.2	58.1	0.2	0.0	0.1	59.5
MWHB	0.3	0.0	0.2	53.2	0.3	0.0	0.3	48.4
NEHB	0.3	0.1	0.3	45.8	0.2	0.0	0.1	60.0
NWHB	0.4	0.0	0.0	93.0	0.6	0.0	0.1	87.3
SEHB	0.3	0.0	0.2	55.3	0.3	0.0	0.1	65.8
SHB	0.1	0.0	0.2	32.1	0.2	0.0	0.4	31.4
WHB	0.2	0.0	0.1	60.0	0.1	0.0	0.2	25.9
Rol	0.2	0.0	0.1	56.4	0.3	0.0	0.2	59.2
NI					0.2	0.0	0.2	56.8

The number of untreated decayed teeth increased with age (Tables 2.3c and d) as the total caries experience increased. The mean $D_{3vc}T$ among 12-year-olds (Table 2.3c) was 0.5, 0.7 and 0.8 in fluoridated Rol, non fluoridated Rol and non fluoridated NI respectively. Among 15-year-olds (Table 2.3d), the corresponding mean $D_{3vc}T$ scores were 0.9, 1.1 and 1.1 respectively. The mean number of teeth missing due to caries was higher in the 12-year-old group than in the 8-year-old group; it was the same for the fluoridated Rol group at age 15 as it was at age 12 (mean MT 0.1). In non fluoridated Rol and non fluoridated NI, the mean MT was 0.1 and 0.2 respectively at age 12, and 0.3 in both groups at age 15. There were lower levels of tooth loss due to caries among the 12-year-olds and the 15-year-olds with fluoridated domestic water supplies. Filled teeth represented the greatest proportion of the total caries experience in these two age groups, ranging in the three groups ('Full FI' Rol, 'Non FI' Rol and 'Non FI' NI) from a mean FT of 0.8 to 1.2 among 12-year-olds, and from 1.5 to 2.9 among 15-year-olds. Over one third of the total caries experience was untreated in the 12-year-old age group. The proportion of caries untreated ($\% D_{3vc}T$) was 36.6%, 40.2% and 36.8% in fluoridated Rol, non fluoridated Rol and non fluoridated NI respectively. Among 15-year-olds, these proportions were 35.8%, 30.0% and 25.9% respectively.

Thus, there is wide variation in the percentage of untreated decay (% $D_{3vc} T$) amongst the health board regions, ranging in 12-year-olds from 17.1% in the non fluoridated SHB region to 74.2% in the non fluoridated NWHB region. There was also wide variation among the health board regions in the proportion of caries, which was untreated for 15-year-olds; it was lowest in non fluoridated MWHB at 18.2% and highest in the fluoridated NAHB region of ERHA at 51.6%.

Table 2.3c Mean number of decayed ($D_{3vc} T$), missing (MT) and filled (FT) teeth, total caries experience recorded and proportion of caries recorded as untreated $D_{3vc} T/D_{3vc} MFT \times 100$ (% $D_{3vc} T$), among 12-year-old children in RoI and NI by fluoridation status

Health Board	12-year-olds							
	Full FI				Non FI			
	$D_{3vc} T$	MT	FT	% untreated (% $D_{3vc} T$)	$D_{3vc} T$	MT	FT	% untreated (% $D_{3vc} T$)
ERHA	0.4	0.1	0.7	31.9				
ERHA-ECAHB	0.3	0.1	0.6	32.7				
ERHA-NAHB	0.5	0.1	0.8	35.8				
ERHA-SWAHB	0.3	0.0	0.8	28.4				
MHB	0.4	0.1	0.7	36.4	0.4	0.2	0.9	27.6
MWHB	0.8	0.1	1.1	39.4	0.4	0.1	1.5	21.8
NEHB	0.6	0.1	1.0	33.7	0.7	0.1	0.9	42.2
NWHB	1.2	0.2	0.7	56.9	1.6	0.1	0.4	74.2
SEHB	0.6	0.1	1.0	35.4	0.3	0.1	1.5	16.5
SHB	0.4	0.1	0.8	32.3	0.3	0.1	1.4	17.1
WHB	0.7	0.1	0.9	41.6				
RoI	0.5	0.1	0.8	36.6	0.7	0.1	1.0	40.2
NI					0.8	0.2	1.2	36.8

Table 2.3d Mean number of decayed ($D_{3vc} T$), missing (MT) and filled (FT) teeth, total caries experience recorded and proportion of caries recorded as untreated $D_{3vc} T/D_{3vc} MFT \times 100$ (% $D_{3vc} T$), among 15-year-old adolescents in RoI and NI by fluoridation status

Health Board	15-year-olds							
	Full FI				Non FI			
	$D_{3vc} T$	MT	FT	% untreated (% $D_{3vc} T$)	$D_{3vc} T$	MT	FT	% untreated (% $D_{3vc} T$)
ERHA	1.1	0.1	1.3	43.3				
ERHA-ECAHB	1.1	0.0	1.3	45.9				
ERHA-NAHB	1.3	0.2	1.1	51.6				
ERHA-SWAHB	0.9	0.1	1.6	35.7				
MHB	1.0	0.2	1.4	39.2	0.9	0.0	1.9	33.0
MWHB	0.6	0.1	1.5	27.0	0.8	0.3	3.1	18.2
NEHB	0.8	0.1	1.9	29.4	1.0	0.3	2.1	29.6
NWHB	1.5	0.1	1.5	48.1	2.0	0.6	1.5	49.5
SEHB	1.0	0.2	1.7	34.9	1.1	0.1	2.1	32.3
SHB	0.7	0.2	1.8	26.0	0.8	0.1	2.5	24.2

	15-year-olds							
	Full FI				Non FI			
	D _{3vc} T	MT	FT	% untreated (% D _{3vc} T)	D _{3vc} T	MT	FT	% untreated (% D _{3vc} T)
WHB	0.7	0.1	1.6	28.2				
Rol	0.9	0.1	1.5	35.8	1.1	0.3	2.3	30.0
NI					1.1	0.3	2.9	25.9

Whilst some of the variation in the proportion of total caries, which is untreated, can be explained by the timing of the survey, it is unlikely to be the full explanation. The variation may be an indication of inequitable access to dental services among areas with different dentist-to-population ratios.

The figures provide an interesting basis for comparison between Rol and NI because of the different systems of delivery of treatment services in the two jurisdictions. Although untreated caries levels are similar among 8- and 12-year-olds in the two jurisdictions, they are lower in NI among 15-year-olds. This age group is more independent and capable of demanding dental services themselves. Within NI, the service is freely available on demand from General Dental Practitioners for this age group. In Rol, whereas the Public Dental Service has been extended to allow for treatment of this age group, in most regions primary school children are the main focus for services and only emergency treatment is available for the 15-year-old group.

2.5 Proportion with no caries

The percentage of children and adolescents with no caries (Table 2.4) in their primary (5-year-olds) or permanent (8-, 12- and 15-year-olds) dentition is another outcome of interest and is a useful measure in the monitoring of trends in oral health. For all four age groups, the figures reflect the trends illustrated by the mean d_{3vc} mft/D_{3vc} MFT data. Almost two thirds (63.1%) of 5-year-olds with fluoridated water had no caries (d_{3vc} mft = 0) in their primary teeth compared with less than half (45.5%) of those without water fluoridation. In NI, the percentage of 5-year-olds caries free in the primary dentition (45.1%) was similar to that in non fluoridated areas in Rol.

Thus, by the time they start primary school, a high proportion of children will already have experienced decay in their primary teeth. Decay in the primary dentition is undesirable because:

- There is danger of infection and damage to the underlying permanent dentition.
- Early loss of primary teeth can result in a loss of space for the permanent teeth resulting in crowding and a need for orthodontic treatment.
- Young children can pose a challenge for dental treatment necessitating the use of general anaesthesia.

Only 79.5% and 75.4% of 8-year-olds in fluoridated and non fluoridated areas respectively were recorded as being caries free in the permanent dentition. This means that one in five children (20.5%) in fluoridated and one in four children (24.6%) in non fluoridated areas already had caries into dentine by age 8. In NI, 75.7% of 8-year-olds were caries free, i.e. 24.3% had caries in their permanent teeth. These figures are high considering that the permanent teeth of these children had been in their mouth for a relatively short period of time. One option for the prevention of caries in 8-year-olds would be to target them with caries preventive programmes at an earlier age.

Less than half of the 12-year-old group in Rol had no caries in their permanent teeth - 46.5% among the fluoridated group, and 37.9% among the non fluoridated group. In NI, only one third (34.3%) of 12-year-olds had no visible dentinal caries in their permanent teeth.

The difference between fluoridated and non fluoridated groups is also seen among the 15-year-olds. A little over one quarter (27.0%) of adolescents in the fluoridated group in Rol were free of cavitated caries, and approximately one fifth of the non fluoridated groups in Rol (20.7%) and in NI (18.9%) had no visible dentinal caries in the permanent dentition.

Another way to look at these data is to focus on the proportion of each age group who had caries, which was 36.9%, 54.5% and 54.9% for 5-year-olds in the fluoridated and non fluoridated RoI groups and the NI group respectively. Among 8-year-olds, it was 20.5%, 24.6% and 24.3% for the fluoridated and non fluoridated RoI group and the NI group respectively. Among 12-year-olds, the percentage with caries was 52.4%, 59.5% and 65.7% for the fluoridated and non fluoridated RoI group and the NI group respectively. For 15-year-olds, it was 73.0%, 79.3% and 81.1% in the fluoridated RoI group, the non fluoridated RoI group and the NI group respectively.

The percentage of children and adolescents with caries had fallen since 1984. For example, the proportion of 5-year-olds in RoI with caries in their primary teeth had fallen from 48% in 1984 to 36.9% in 2002 in fluoridated areas and from 62% in 1984 to 54.5% in 2002 in non fluoridated areas. For 15-year-olds in RoI, the percentage with caries had fallen from 88% in 1984 to 73.0% in 2002 in fluoridated areas and from 92% in 1984 to 79.3% in 2002 in non fluoridated areas.

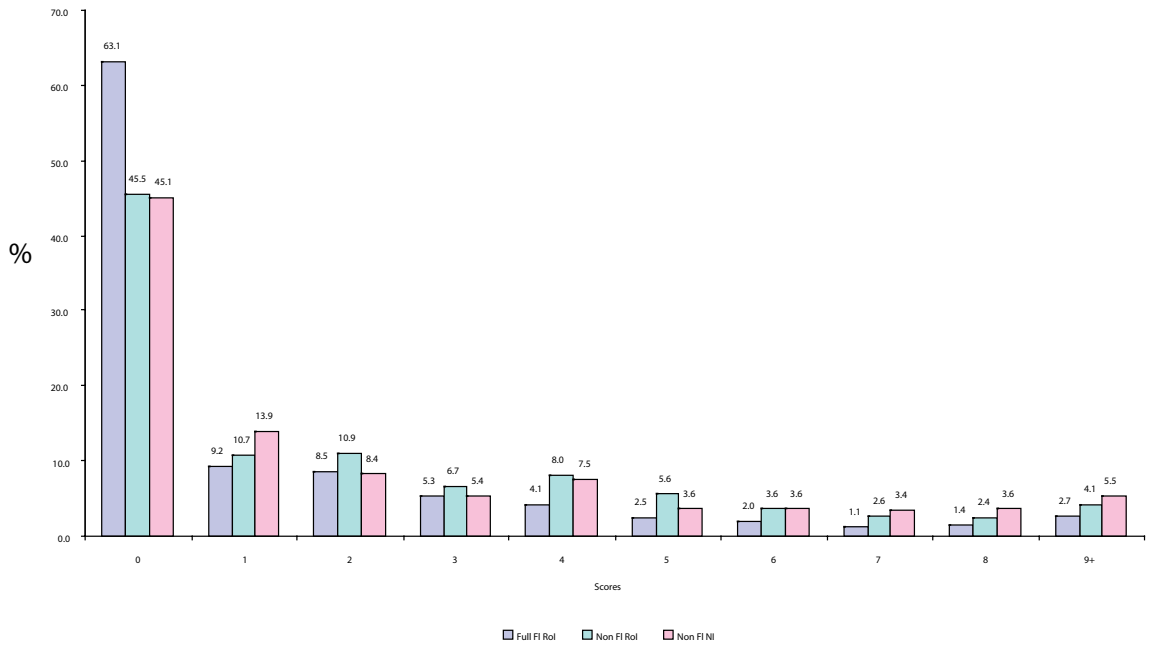
Table 2.4 The percentage of children and adolescents in RoI and NI with no caries (d_{3vc} mft / D_{3vc} MFT = 0) in their primary (5-year-olds) or permanent (8-, 12- and 15-year-olds) teeth by age group and fluoridation status

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
ERHA	68.4		80.2		51.0		28.5	
ERHA-ECAHB	73.3		86.8		56.3		29.2	
ERHA-NAHB	63.8		76.5		45.4		28.3	
ERHA-SWAHB	69.0		79.8		53.1		28.2	
MHB	57.1	53.4	77.6	77.1	48.8	41.9	26.7	32.4
MWHB	54.5	45.3	77.1	70.6	38.0	36.4	29.7	20.1
NEHB	59.1	49.2	75.3	78.8	47.1	41.2	26.1	21.4
NWHB	46.9	31.2	71.8	71.2	34.7	24.0	18.2	16.0
SEHB	54.5	51.7	73.8	77.4	36.2	35.2	22.5	15.8
SHB	68.3	48.2	86.1	75.5	52.3	45.8	31.4	26.2
WHB	64.4	45.0	82.4	79.1	40.7		22.9	
Total RoI	63.1	45.5	79.5	75.4	46.5	37.9	27.0	20.7
Total NI		45.1		75.7		34.3		18.9

The distribution of caries in the population is of interest, as it can determine whether caries is evenly distributed or whether some children bear a disproportionate amount of the disease. The percentage distribution of caries is shown in Figures 2.2a to 2.2d for each age group according to fluoridation status in RoI and for non fluoridated NI.

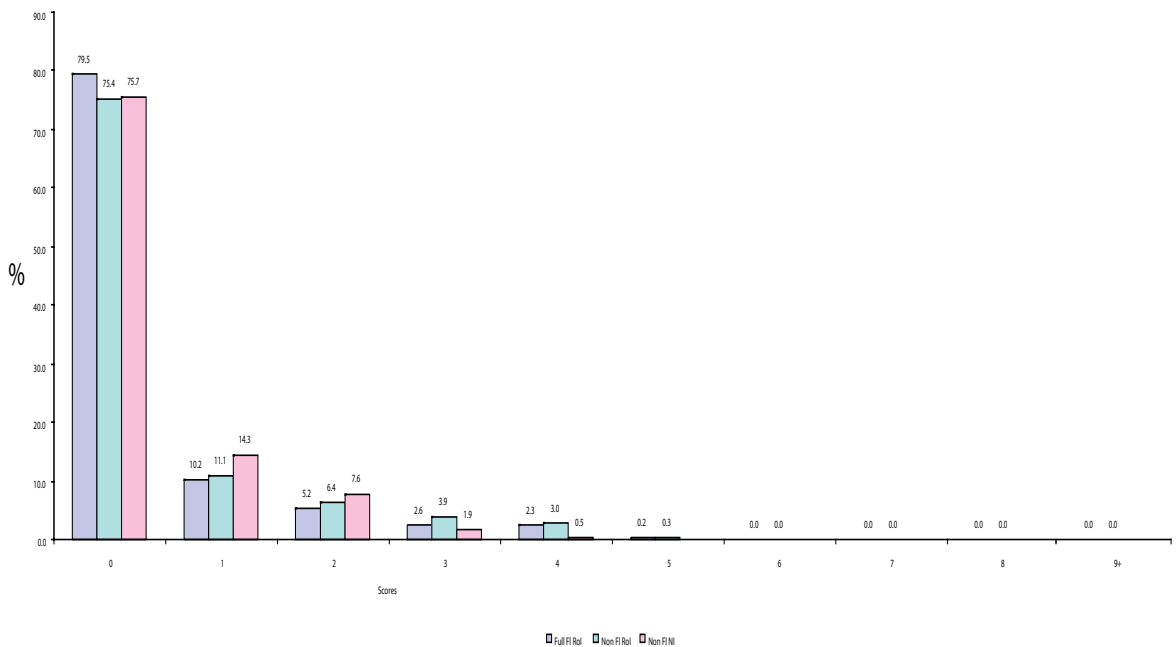
The distribution of caries among 5-year-olds was unimodal and skewed to the right; the modal d_{3vc} mft score was 0. There was a lower proportion of children with domestic water fluoridation at all levels (except 0) than those without. A considerable percentage (9.7% in RoI fluoridated, 18.3% in RoI non fluoridated and 19.7% in NI non fluoridated) of children had experienced caries on five or more teeth.

Figure 2.2a 5-year-old children: percentage frequency distribution of d_{3vc} mft scores



The distribution of caries on permanent teeth D_{3vc} MFT for 8-year-olds was also unimodal (modal value = 0) and skewed to the right. Although the prevalence of caries was low in this group, 10.3% in fluoridated Rol, 13.6% in non fluoridated Rol, and 10.0% in non fluoridated NI had experienced caries on two or more permanent teeth by age 8.

Figure 2.2b 8-year-old children: percentage frequency distribution of D_{3vc} MFT scores



Among 12-year-olds, the distribution of caries was also skewed to the right for all three groups. In this age group, 6.3% in fluoridated RoI, 10.2% in non fluoridated RoI and 12.5% in non fluoridated NI had caries in five or more permanent teeth by age 12.

Figure 2.2c 12-year-old children: percentage frequency distribution of D_{3vc} MFT scores

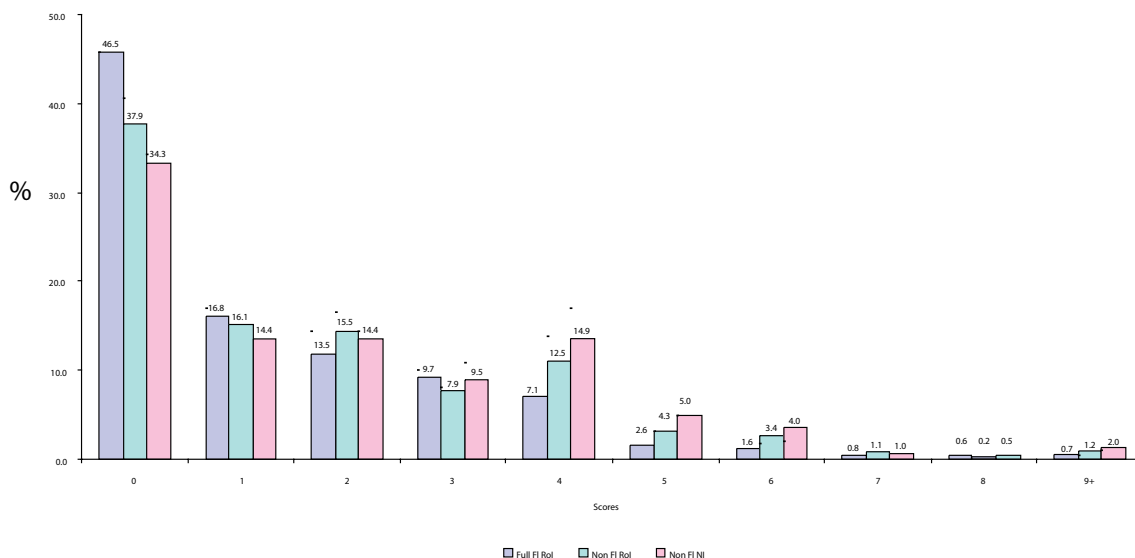
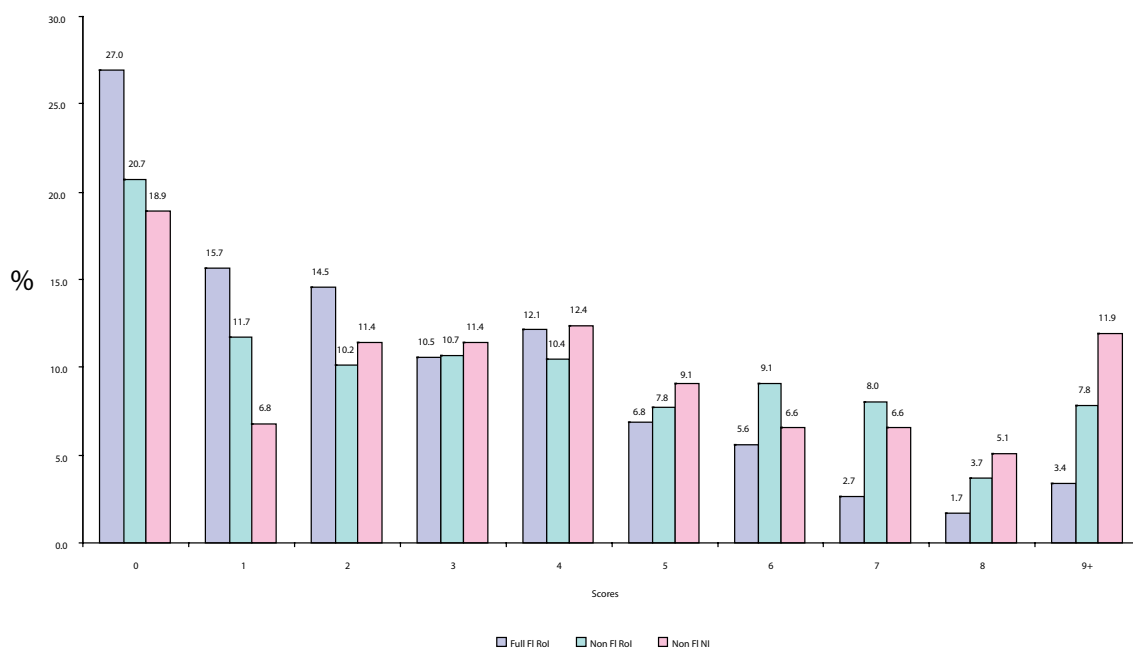


Figure 2.2d 15-year-old children: percentage frequency distribution of D_{3vc} MFT scores



Among 15-year-olds in fluoridated areas in RoI, the distribution of caries is bimodal (modes = 0 and 4), in non fluoridated RoI it is bimodal (modes = 0 and 6) and in NI bimodal (modes = 0 and 4). In this group in fluoridated and non fluoridated RoI and non fluoridated NI, 20.2% 36.4% and 39.3% respectively have caries scores of 5 or more.

2.6 Significant caries index

The significant caries index (SiC) was developed by Bratthall³. The SiC index is designed to focus attention on those individuals with the highest caries scores in each population. It is calculated as follows: individuals are sorted according to their d_{3vc} mft/ D_{3vc} MFT scores, the one third of the population

with the highest caries scores is selected and the mean d_{3vc} mft/ D_{3vc} MFT score for this subgroup is calculated.

Table 2.5 Significant caries index (SiC): mean caries score for the 33% of children and adolescents with the highest d_{3vc} mft / D_{3vc} MFT scores, and mean caries score for the total sample by age group and fluoridation status

	5-year-olds			8-year-olds			12-year-olds			15-year-olds		
	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI
Upper 33% mean SiC	4.0	5.8	6.1	1.2	1.5	1.1	3.6	4.3	4.7	5.8	8.8	8.5
Sample mean	1.3	2.2	2.3	0.4	0.5	0.4	1.4	1.8	2.1	2.6	3.8	4.3

Whilst population means are a useful tool for monitoring oral health, they can obscure the situation experienced by those with poor oral health. For the one third of children and adolescents represented by the SiC index, the mean d_{3vc} mft/ D_{3vc} MFT score is considerably greater than the average for their age group (Table 2.5). For example, in the 5-year-old group, whilst the sample mean d_{3vc} mft for those with fluoridated water in Rol is 1.3, the mean d_{3vc} mft for the third with the highest caries scores is 4.0 (208% higher). In the case of those without water fluoridation in Rol, the mean d_{3vc} mft scores are 2.2 vs. 5.8 (164% higher), and in NI the mean d_{3vc} mft scores are 2.3 vs. 6.1 (165% higher). The situation for the other age groups is similar. This high caries group, as identified by the SiC index, would benefit from early identification if effective caries preventive interventions could be delivered to them before they develop high caries levels. Brathall³ suggests that the SiC index for 12-year-olds should be no more than 3.0 by the year 2015.

2.7 Caries in anterior teeth

Tooth surfaces can be categorized according to whether they have pits and fissures (pit and fissure surfaces), or whether they are smooth surfaces (no pits or fissures). The greatest effect of fluoride is seen on the smooth surfaces. Most of the pits and fissures are on posterior teeth; anterior teeth (i.e. incisors and canines), have mainly smooth surfaces.

Table 2.6a shows the percentage of children and adolescents with caries into dentine, either visible through the enamel or cavitated (d_{3vc} mft/ D_{3vc} MFT) in anterior teeth in 2002. To enable comparison with the 1984 data, the table also presents the same percentage at cavitation level (d_{3c} mft/ D_{3c} MFT). In 2002, the prevalence of anterior caries in permanent teeth D_{3vc} MFT in Rol ranged from 0.5% among 8-year-olds to 17.5% among 15-year-olds in non fluoridated areas (Table 2.6a). In NI, the prevalence for permanent teeth ranged from 0% among 8-year-olds to 18.4% among 5-year-olds. The percentage of children with anterior caries in permanent teeth tends to increase with age. Anterior caries is less common among 5- and 15-year-old children and adolescents with fluoridated domestic water supplies.

Comparing the data from 1984 and 2002, the prevalence of caries at cavitation level (d_{3c} mft/ D_{3c} MFT) on anterior teeth has diminished over time. This is most probably due to the additive effects of an increase in the use of oral health products with fluoride since 1984 and the continuing effect of water fluoridation. Among 5-year-olds in Rol, the percentage of children with cavitated caries in their anterior primary teeth dropped from 15.6% to 8.9% in fluoridated areas, and from 25.8% to 13.0% in non fluoridated areas. Among 15-year-olds, the change was from 12.4% to 8.7% and from 28.4% to 13.2% in fluoridated and non fluoridated areas respectively. Although the percentage of children and adolescents in Rol with caries in anterior teeth was lower in 2002 than in 1984, it still remains a problem affecting a substantial percentage of children and adolescents.

Table 2.6a Percentage of children and adolescents affected by anterior caries (incisors and canines)

	5-year-olds			8-year-olds			12-year-olds			15-year-olds		
	Full FI	Non FI	NI	Full FI	Non FI	NI	Full FI	Non FI	NI	Full FI	Non FI	NI
2002 d_{3vc}mft / D_{3vc}MFT	9.7	13.4	18.4	0.6	0.5	0.0	4.9	4.8	9.0	10.2	17.5	16.4
2002 d_{3c}mft / D_{3c}MFT	8.9	13.0	17.1	0.5	0.5	0.0	4.2	4.1	5.5	8.7	13.2	12.6
1984 d_{3c}mft / D_{3c}MFT	15.6	25.8		0.4	1.6		10.1	16.0		12.4	28.4	

Table 2.6b shows the percentage of children and adolescents with caries into dentine, either visible through the enamel or cavitated (d_{3vc}mft/D_{3vc}MFT), in 2002, by age group and fluoridation status for each of the health board regions in Rol. There was considerable variation amongst the regions, with the highest level of 22.1% reported among 15-year-olds in non fluoridated areas of the MWHB region. In contrast, only 7.5% of 15-year-olds in fluoridated areas of the MWHB region had caries on their anterior teeth.

Table 2.6b Percentage of children and adolescents affected by anterior caries (incisors and canines) by health board region, Rol and NI

Health Board	Age Group							
	5		8		12		15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
ERHA	9.4		0.7		4.3		9.1	
ERHA-ECAHB	9.2		0.0		4.7		10.9	
ERHA-NAHB	9.9		0.6		5.2		10.5	
ERHA-SWAHB	9.3		1.3		3.3		7.0	
MHB	10.7	16.5	0.0	0.0	1.6	0.0	10.4	7.8
MWHB	14.5	14.0	0.0	0.0	7.9	6.8	7.5	22.1
NEHB	6.4	12.1	0.0	1.0	7.9	4.1	11.3	11.8
NWHB	17.4	15.7	2.4	0.0	6.1	6.0	16.4	14.4
SEHB	13.9	18.4	0.4	0.0	4.2	3.8	12.0	20.7
SHB	5.7	11.3	0.7	0.7	4.7	6.1	8.0	18.1
WHB	6.2	11.0	0.0	0.0	5.2		13.9	
Rol	9.7	13.4	0.6	0.5	4.9	4.8	10.2	17.5
NI		18.4		0.0		9.0		16.4

The mean number of anterior teeth with caries was highest in the primary teeth of 5-year-olds living in non fluoridated areas (Table 2.7). Anterior caries was considerably higher among NI children. The average number of anterior surfaces with caries among NI 5-year-olds was 1.2; this compares with 0.6 surfaces among Rol 5-year-olds with fluoridated domestic water supplies and 0.8 surfaces for those without domestic water fluoridation. Permanent anterior teeth are not present in the mouth for long enough to develop caries at age 8, but by age 12 there was some anterior caries in evidence; there was no difference according to fluoridation status although those in NI had more surfaces with caries when compared to Rol children. At age 15, adolescents with fluoridated domestic water supplies had considerably fewer surfaces affected by caries on the anterior teeth: 0.4 surfaces vs. 0.7 surfaces. In NI, the level of caries on anterior teeth was greater again at 0.9 surfaces. Given the aesthetic importance of anterior teeth, this is a clinically significant difference.

Table 2.7 Mean number of decayed, missing and filled anterior teeth (t/T) and surfaces (s/S) in 5-, 8-, 12- and 15-year-olds in Rol and NI by age group and fluoridation status

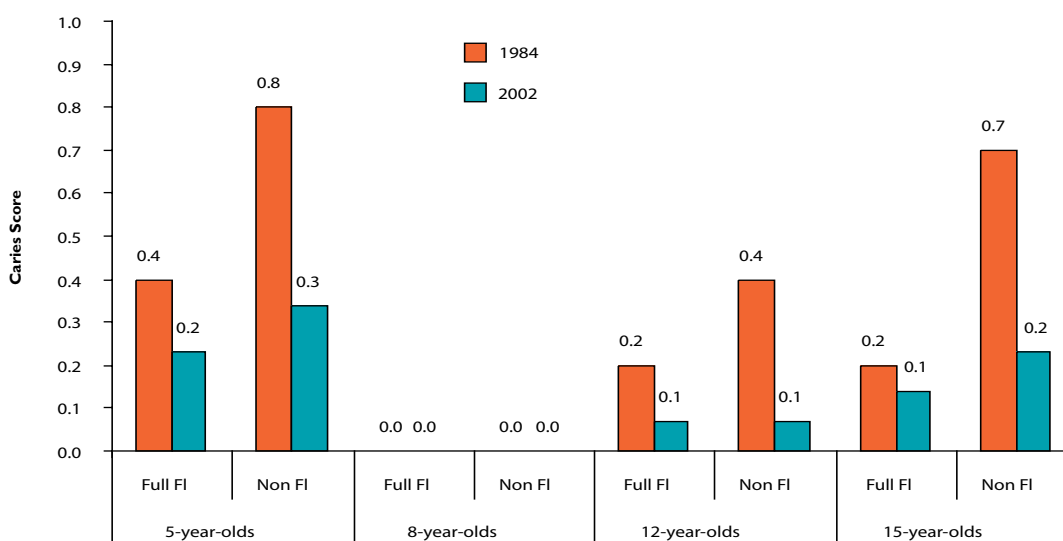
	5-year-olds		8-year-olds		12-year-olds		15-year-olds	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
Rol teeth	0.2	0.4	0.0	0.0	0.1	0.1	0.2	0.3
Rol surfaces	0.6	0.8	0.0	0.0	0.2	0.2	0.4	0.7
NI teeth		0.5		0.0		0.1		0.4
NI surfaces		1.2		0.0		0.3		0.9

The reduction in anterior caries shown by the difference between 1984 and 2002 in the percentage of children and adolescents with anterior caries in Table 2.6a is also illustrated in Table 2.8 and Figure 2.3. These show the reduction in the mean number of anterior teeth with caries in both fluoridated and non fluoridated areas since 1984. Whilst anterior caries is still less common among children with fluoridated water supplies, the reduction since 1984 has been relatively larger in non fluoridated areas.

Table 2.8 Change in anterior caries between 1984 and 2002 for 5-, 8-, 12- and 15-year-olds in Rol by age group and fluoridation status

Anterior teeth / surfaces	5-year-olds		8-year-olds		12-year-olds		15-year-olds	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
d_{3c}mft/D_{3c}MFT 2002	0.2	0.3	0.0	0.0	0.1	0.1	0.1	0.2
d_{3c}mft/D_{3c}MFT 1984	0.4	0.8	0.0	0.0	0.2	0.4	0.2	0.7
d_{3c}mfs/D_{3c}MFS 2002	0.5	0.7	0.0	0.0	0.2	0.2	0.3	0.5
d_{3c}mfs/D_{3c}MFS 1984	0.7	1.3	0.0	0.0	0.3	0.5	0.3	1.0

Figure 2.3 Cavitated anterior caries in Rol in 1984 and 2002



2.8 Caries on pit and fissure and smooth surfaces

Whilst anterior teeth have mainly smooth surfaces, there are smooth surfaces on other teeth also. The premolars, for example, have four smooth surfaces and one pit and fissure surface. All molars have four

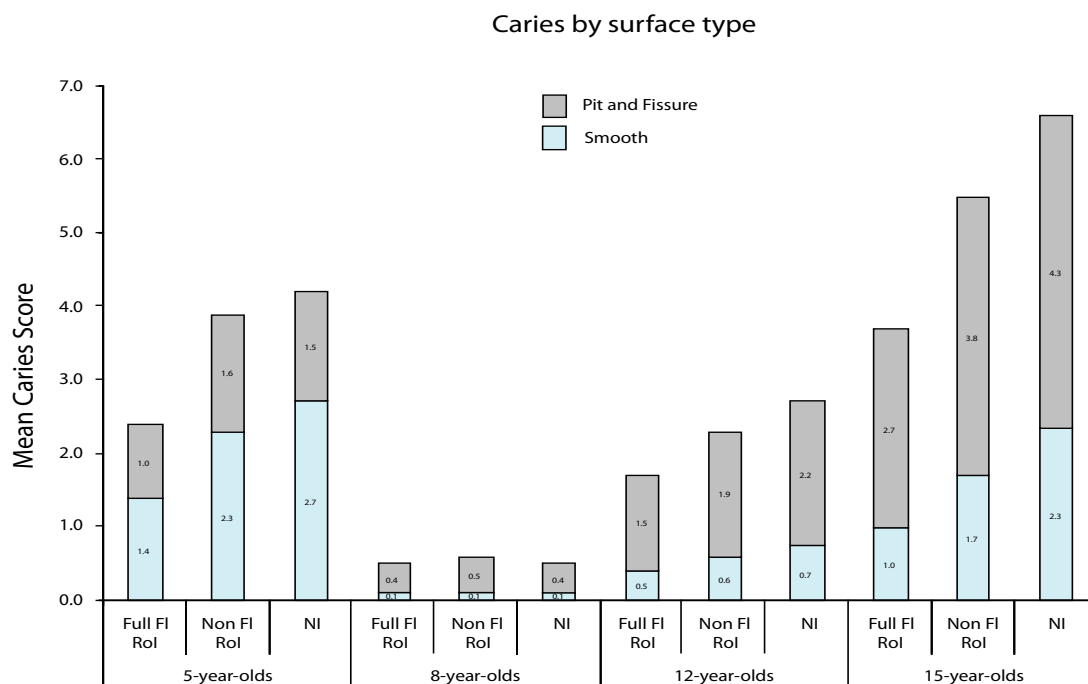
smooth surfaces and one or two pit and fissure surfaces. Prevention of caries on smooth surfaces is achieved mainly by fluoridation. It can also be achieved by dietary means, but dietary behaviour change is notoriously difficult to achieve. Pit and fissure caries, on the other hand, is most easily prevented by the application of a plastic resin called a 'fissure sealant' to the pits and fissures of the teeth. Table 2.9 shows the level of caries according to surface type. The $d_{3vc} \text{fpfs} / D_{3vc} \text{FPFS}$ is the mean number of decayed (including visual component) and filled pit and fissure surfaces, and the $d_{3vc} \text{fss} / D_{3vc} \text{FSS}$ is the number of decayed (including visual component) and filled smooth surfaces.

Table 2.9 Mean caries scores according to surface type, mean number of decayed and filled smooth surfaces ($d_{3vc} \text{fss} / D_{3vc} \text{FSS}$), decayed and filled pit and fissure surfaces ($d_{3vc} \text{fpfs} / D_{3vc} \text{FPFS}$), mean decayed and filled score on all surfaces, % of all caries on pit and fissure surfaces and mean number of fissure sealed surfaces by age group and fluoridation status

Surface Type	5-year-olds			8-year-olds			12-year-olds			15-year-olds		
	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI	Full FI Rol	Non FI Rol	Non FI NI
Smooth ($d_{3vc} \text{fss} / D_{3vc} \text{FSS}$)	1.4	2.3	2.7	0.1	0.1	0.1	0.5	0.6	0.7	1.0	1.7	2.3
Pit and Fissure ($d_{3vc} \text{fpfs} / D_{3vc} \text{FPFS}$)	1.0	1.6	1.5	0.4	0.5	0.4	1.5	1.9	2.2	2.7	3.8	4.3
Total $d_{3vc} \text{fs} / D_{3vc} \text{FS}$	2.4	3.9	4.2	0.5	0.6	0.5	1.9	2.5	2.9	3.7	5.5	6.6
% due to pit and fissure caries	40.2	40.8	35.5	83.0	82.5	81.6	76.4	76.8	74.4	73.8	69.3	64.6
Mean no. of fissure sealed surfaces	0.0	0.0	0.0	1.6	1.7	1.1	2.7	2.0	2.0	3.2	2.7	2.5

For 5-, 12- and 15-year-olds, there was more of each type of caries among those without fluoridated domestic water supplies. Levels in non fluoridated NI were higher than those in the non fluoridated Rol group, which in turn were higher than those in the fully fluoridated Rol group. For permanent teeth in 8-, 12- and 15-year-olds, pit and fissure caries was most common. Among 8-year-olds in Rol, 83.0% of the caries experience was due to pit and fissure caries, while in non fluoridated NI this figure was 81.6%. For 12-year-olds, it represented 76.4% of caries in full fluoridated Rol, 76.8% of caries in non fluoridated Rol and 74.4% in non fluoridated NI. For 15-year-olds, pit and fissure caries accounted for 73.8% of the score among those with water fluoridation, 69.3% among those without water fluoridation in Rol, and 64.6% of the score in non fluoridated NI. The contribution of pit and fissure caries to the total number of decayed and filled teeth among 8-, 12- and 15-year-olds is illustrated in Figure 2.4.

Figure 2.4 Caries according to surface type, mean number of decayed and filled smooth surfaces ($d_{3vc} fss/D_{3vc} FSS$), decayed and filled pit and fissure surfaces ($d_{3vc} fpfs/D_{3vc} FPFS$), by age group and fluoridation status



2.9 Progress towards oral health goals for 2000

The Dental Health Action Plan in RoI, formed in response to the Irish Government Health Strategy “Shaping a Healthier Future”, was published in 1994. It set a goal for the year 2000 that “twelve year old children in optimally fluoridated areas will have, on average, no more than one decayed, missing or filled permanent tooth, and in less than optimally fluoridated areas no more than two decayed, missing or filled permanent teeth”. The goals referred to caries as counted historically at cavitation level. In fluoridated areas in 2002, the goal was being approached, as 12-year-old children had, on average, 1.2 decayed, missing or filled permanent teeth (D_{3c} MFT). In non fluoridated areas, decay levels were well within the set goal, as the number of decayed, missing or filled permanent teeth was, on average, 1.4 - well below the goal of 2.0. The goal for 5-year-olds for the year 2000, set in the Dental Health Action Plan in 1994, was that 85% of 5-year-olds in optimally fluoridated areas and 60% of those in non fluoridated areas should be caries free. At 70% and 53% (rounding up) caries free (i.e. no caries at cavitation level) respectively, this goal was not achieved; however, preschool children have not generally been a target for caries preventive services. New caries preventive programmes would be needed if progress towards lower levels of decay were to be achieved in this age group.

2.10 Changes in caries levels over time

For historical comparisons, caries is measured at cavitation level, as was done in the earlier surveys. These scores are lower than those that include caries at the non cavitated dentinal level (i.e. visual caries). Caries levels in RoI and NI have changed dramatically since the early 1960s in both fluoridated and non fluoridated areas. The changes are illustrated by fluoridation status and jurisdiction in Figures 2.5a (5-year-olds), 2.5b (8-year-olds), 2.5c (12-year-olds) and 2.5d (15-year-olds) for the 1960s, 1984 and 2002.

The changes at health board level are shown for RoI in Table 2.10 for 1961-’63⁴, 1984⁵ and for the 1990s^{6 7 8 9 10 11 12}. Changes for NI as a whole are also shown in Table 2.10. Data for the 1990s are available for seven of the (original) eight health board regions. The 1961-’63 data are taken from the reports of the statutory pre-fluoridation surveys, which were carried out in all areas of the country at the time. The 1960s data are therefore not broken down by fluoridation status. The 1984 data are taken from the 1984 National Survey of Children’s Dental Health, and are presented for fully fluoridated and non fluoridated groups, which are comparable with the similar groupings in the present survey. Similarly, the 1990s data are presented according to fluoridation status.

The 1990s regional surveys were carried out as a result of individual requests from health boards at different times. The WHB survey was carried out in 1991, the SHB survey in 1993, the NEHB survey in 1995, the EHB survey in 1993 and again in 1997 (the results for the 1997 survey are presented here), the MWHB in 1997, the NWHB in 1997/'98 and the SEHB in 1998/'99. Comparisons are not available for the three constituent boards of the ERHA because at the time of the surveys the ERHA was a single administrative unit, namely the Eastern Health Board (EHB). Data for the ERHA as a whole in 2002 are therefore presented for comparison with historical EHB data. Not all four age groupings were included in every regional survey.

For NI, 1960s data is taken from a 1963 survey of Belfast schools¹³. The 1980s data is from the NI sample in the 1983 OPCS decennial UK Child Oral Health Survey¹⁴. In 1991, the Oral Health Services Research Centre directed a survey in NI¹⁵ using the same examination criteria used in the 1984 National Survey of Children's Dental Health, and the results of that survey are used for the 1990s comparison.

The examination criteria used in the 1990s and 2001/2002 surveys for caries at cavitation level are identical (except for the NI 1990 survey where a sharp probe was used). In the 1984 and 1961-'63 surveys, a sharp probe was used to confirm a diagnosis of cavitation. The use of sharp probes was abandoned in the later studies and replaced with a probe with a 0.5 mm ball tip (WHO probe). This change is likely to have a small impact on reported caries levels, as slightly less caries would be confirmed with a 0.5 mm probe than with a sharp probe. The impact of the change has not been quantified but is likely to be minor. In all studies, identical standardised criteria were used for contemporaneous measurement of all conditions across fluoridated and non fluoridated groups.

Figure 2.5a Mean number of primary teeth which were decayed (cavitated), missing or filled due to caries ($d_{3c}mft$) among 5-year-olds by fluoridation status over time

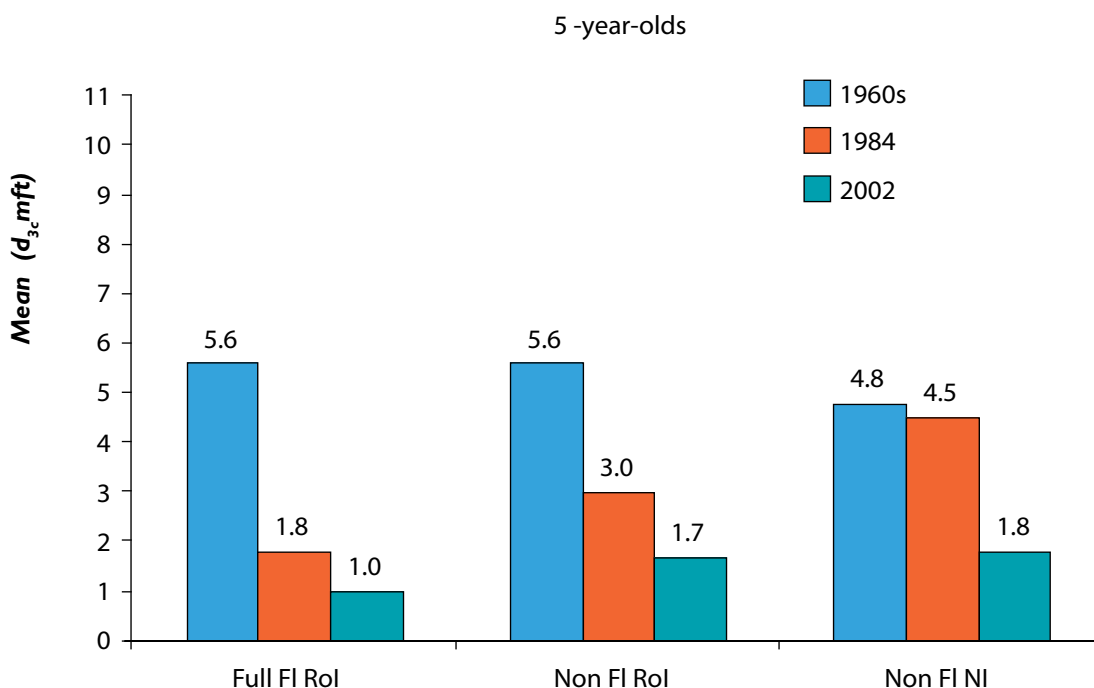


Figure 2.5b Mean number of permanent teeth which were decayed (cavitated), missing or filled due to caries ($D_{3c}MFT$) among 8-year-olds by fluoridation status over time

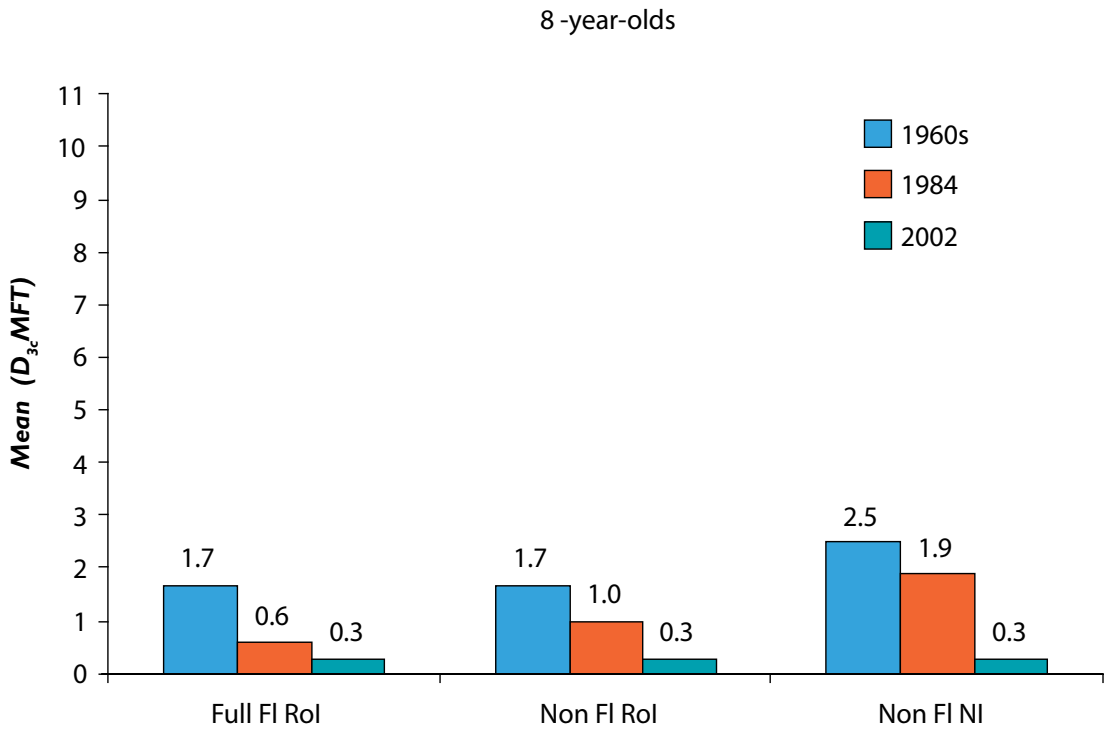


Figure 2.5c Mean number of permanent teeth which were decayed (cavitated), missing or filled due to caries ($D_{3c}MFT$) among 12-year-olds by fluoridation status over time

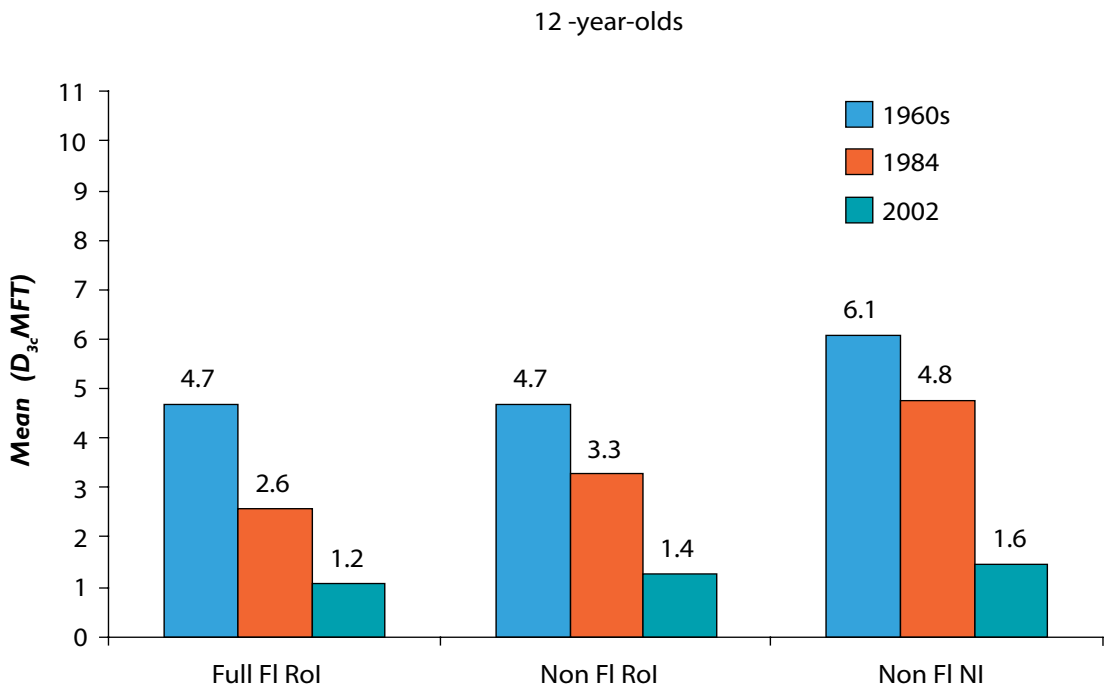
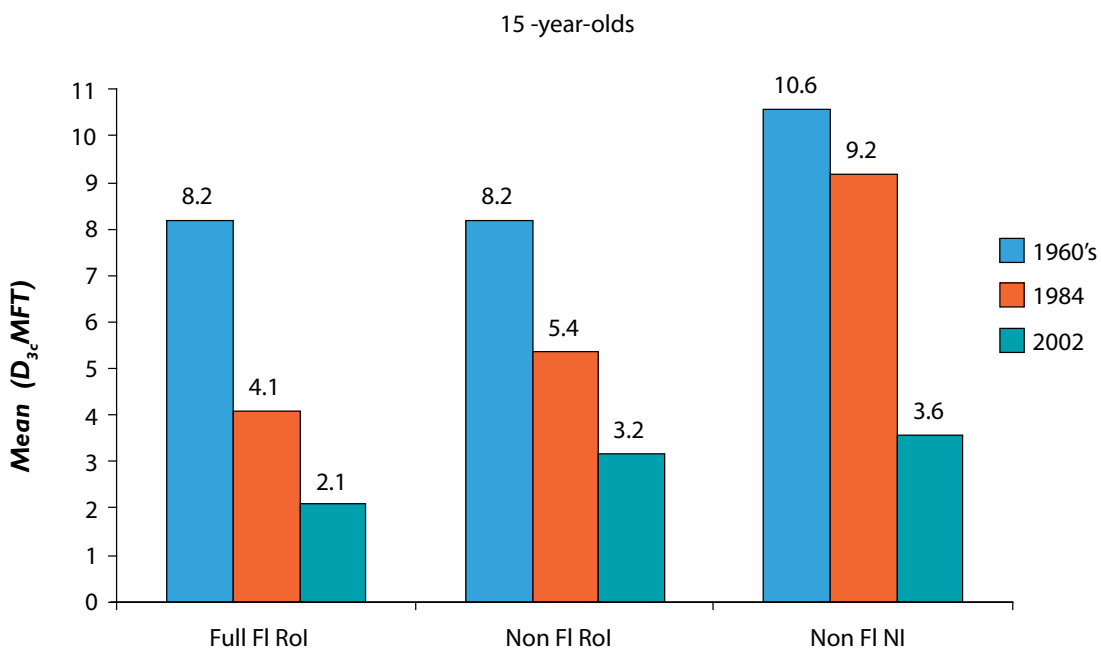


Figure 2.5d Mean number of permanent teeth which were decayed (cavitated), missing or filled due to caries ($D_{3c}MFT$) among 15-year-olds by fluoridation status, over time



The data (Figures 2.5a-d) show that for both children and adolescents with and without water fluoridation, both in Rol and NI, decay levels were much lower in 2002 than they were in 1984 ($p < 0.0001$ all groups) and in 1961-'63 in all age groups.

Table 2.10 Mean number of primary teeth which were decayed (cavitated), missing or filled due to decay ($d_{3c}mft/D_{3c}MFT$) among 5-, 8-, 12- and 15-year-olds living in fully fluoridated and non fluoridated areas in the 1960s, 1984, 1990s and 2002 in Rol and NI

Health Board	Full Fluoridated				Non Fluoridated			
	1960s	1984	1990s	2002	1960s	1984	1990s	2002
5-year-olds								
ERHA	5.6	1.3	1.0	0.8	5.6	2.9	1.7	
MHB	5.2	1.9		1.2	5.2	3.0		1.6
MWHB	6.4	2.3	1.7	1.4	6.4	4.0	2.9	1.7
NEHB	5.0	1.0	1.2	1.1	5.0	2.1	1.8	1.6
NWHB	5.2	1.7	1.1	1.5	5.2	3.0	1.8	1.9
SEHB	6.3	1.9	1.0	1.6	6.3	2.8	1.8	1.9
SHB	6.4	2.5	1.1	0.9	6.4	4.0	2.3	1.8
WHB	5.0	1.5	1.0	0.8	5.0	2.2	2.1	1.8
Rol	5.6	1.8		1.0	5.6	3.0		1.7
NI					4.8	4.5	2.8	1.8
8-year-olds								
ERHA	2.0	0.5		0.3	2.0	1.0		
MHB	1.6	0.5		0.3	1.6	0.9		0.3
MWHB	1.9	1.0	0.6	0.3	1.9	1.1	0.8	0.4
NEHB	1.5	0.5	0.3	0.5	1.5	0.6	0.3	0.3
NWHB	1.5	0.8	0.3	0.2	1.5	1.1	0.4	0.3
SEHB	1.8	0.4	0.4	0.4	1.8	1.2	0.3	0.2

	Full Fluoridated				Non Fluoridated			
	1960s	1984	1990s	2002	1960s	1984	1990s	2002
8-year-olds								
SHB	1.9	0.9	0.3	0.3	1.9	1.0	0.5	0.4
WHB	1.4	0.4	0.4	0.2	1.4	0.9	0.5	0.2
RoI	1.7	0.6		0.3	1.7	1.0		0.3
NI					2.5	1.9	1.0	0.3
12-year-olds								
ERHA	5.2	2.2	1.1	1.0	5.2	3.4	1.8	
MHB	4.6	2.5		1.1	4.6	2.5		1.3
MWHB	4.9	3.1	1.4	1.5	4.9	3.7	2.1	1.7
NEHB	4.3	2.3	1.2	1.4	4.3	2.8	1.6	1.4
NWHB	4.2	2.4	1.2	1.4	4.2	3.9	1.5	1.1
SEHB	5.2	2.2	1.2	1.3	5.2	3.5	1.8	1.9
SHB	5.4	3.3	1.3	1.1	5.4	4.1	1.8	1.7
WHB	4.2	2.3	1.6	1.2	4.2	3.0	2.1	
RoI	4.7	2.6		1.2	4.7	3.3		1.4
NI					6.1	4.8	3.1	1.6
15-year-olds								
ERHA	8.8	3.7		2.0	8.8	4.8		
MHB	8.0	3.5		2.2	8.0	3.9		2.5
MWHB	8.2	4.3	3.0	1.9	8.2	5.9	3.8	3.7
NEHB	7.7	4.1	2.2	2.4	7.7	5.2	2.7	2.8
NWHB	7.8	2.3	2.2	2.0	7.8	5.8	3.3	2.9
SEHB	8.9	4.0	3.0	2.2	8.9	5.6	3.3	2.7
SHB	9.5	5.4	2.8	2.4	9.5	6.8	4.3	3.2
WHB	7.3	4.5		2.1	7.3	4.8		
RoI	8.2	4.1		2.1	8.2	5.4		3.2
NI					10.6	9.2	5.8	3.6

The changes since the 1990s seen in Table 2.10 vary according to health board region. It should be noted that the health board oral health surveys were undertaken in different years in the 1990s. The WHB survey was undertaken in 1991 followed by the SHB in 1993, it was 1995 for the NEHB, 1997 for the ERHA, the MWHB and the NWHB, and 1998 for the SEHB. As a result, there was a ten-year gap between the 1991 WHB survey and the current survey whereas in the SEHB the gap was only three years. Clearly, there was little time over which changes in caries levels could occur in the SEHB; this also applies to the NWHB where there was a four-year interval since the previous survey.

The data shown here appear to show little further decline in caries levels among 5-year-olds in fluoridated areas since the 1990s. For example, levels reported for 2002 are higher in the NWHB (mean d_{3c} mft 1.5) and SEHB (mean d_{3c} mft 1.6) than those reported in the NWHB in 1997/'98 (mean d_{3c} mft 1.1) and SEHB in 1998/'99 (mean d_{3c} mft 1.0). In other health board regions, there was a decrease ranging from 0.1 to 0.3 d_{3c} mft. In non fluoridated areas, mean d_{3c} mft scores reported for 2002 in the NWHB and SEHB were similar to the levels reported in their recent 1990s studies: there was an increase of 0.1 d_{3c} mft from a mean d_{3c} mft of 1.8 to 1.9 in both regions. Among the other health board regions, there was a decrease in caries levels ranging from 0.2 d_{3c} mft in the NEHB (mean d_{3c} mft of 1.8 in 1995 and 1.6 in 2002), to 1.2 d_{3c} mft in the MWHB (mean d_{3c} mft of 2.9 in 1997 and 1.7 in 2002). This trend is consistent with that reported in recent years among 5-year-olds in England and Wales¹⁶, where there was a slight decrease (4%) between 1997/1998 and 1999/2000 and a slight increase (3%) between 1999/2000, and 2002. In NI, mean d_{3c} mft levels among 5-year-olds continued to decline from the 1960s (mean d_{3c} mft 4.8) through the 1980s (mean d_{3c} mft 4.5) and 1990s (mean d_{3c} mft 2.8) up to 2002 (mean d_{3c} mft 1.8). It must be noted that there was an 11-year interval since the last study referenced here for NI, hence the NI data would not reflect a more recent trend towards leveling off of caries levels if this had taken place in NI during the late 1990s.

The decline in caries levels in the permanent teeth of 8-, 12- and 15-year-olds continued into the 1990s for both those with and without water fluoridation. One exception is the NEHB region, which has seen little improvement in the caries levels since 1995, particularly in fluoridated areas where, in all three age groups, there has been an increase in caries levels since 1995.

In light of the suggested trend towards ‘bottoming out’ of caries levels among 5-year-olds, future monitoring of changes in caries levels is important. In fluoridated areas, the decline in caries levels amongst 5-year-olds appears to have come to a halt and there is some evidence of an increase in caries levels since the most recent regional surveys in the second half of the 1990s. The achievement of further reductions in dental caries levels among Irish children will depend on the timely introduction of effective preventive approaches.

Teeth are healthier in children who get fluoride in their water supply and decay levels were much lower in 2002 than they were in 1984 in both fluoridated and non fluoridated areas. There has also been a dramatic decline in dental caries levels since the 1960s.

Fluoride has contributed to improvements in oral health in non fluoridated as well as fully fluoridated areas. The use of fluoridated toothpaste was almost universal in 2002; over 95% of toothpaste sold in Ireland contains fluoride¹⁷. These toothpastes were introduced to the market in the early 1970s. Another factor is the consumption in non fluoridated areas of foods and drinks which contain fluoride incorporated into the food during processing with fluoridated water in urban areas (the “halo effect”). Research is currently underway to develop methods of measurement of dietary fluoride intake levels amongst Irish children in both fluoridated and non fluoridated areas.

2.11 Changes in decayed, missing and filled components of $d_{3c}mft/D_{3c}MFT$ between 1984 and 2002

Table 2.11 Mean number of decayed ($d_{3c}t/D_{3c}T$), missing (mt/MT) and filled (ft/FT) teeth, and proportion of caries recorded as untreated ($\%d_{3c}t/d_{3c}mft \times 100$, $\%D_{3c}T/D_{3c}MFT \times 100$) for 5-, 8-, 12-, and 15-year-olds between 1984 and 2002 in RoI

	5-year-olds							
	Full FI				Non FI			
	$d_{3c}t$	mt	ft	% of caries untreated (% $d_{3c}t$)	$d_{3c}t$	mt	ft	% of caries untreated (% $d_{3c}t$)
1984	1.4	0.3	0.1	77.8	2.5	0.4	0.1	83.3
2002	0.8	0.2	0.1	77.2	1.3	0.3	0.1	78.4

	8-year-olds							
	Full FI				Non FI			
	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)
1984	0.4	0.0	0.2	66.7	0.6	0.1	0.3	60.0
2002	0.1	0.0	0.1	44.8	0.1	0.0	0.2	37.5

	12-year-olds							
	Full FI				Non FI			
	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)
1984	0.6	0.4	1.6	23.1	0.9	0.5	1.9	27.3
2002	0.2	0.1	0.8	20.7	0.3	0.1	1.0	22.9

	15-year-olds							
	Full FI				Non FI			
	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)	$D_{3c}T$	MT	FT	% of caries untreated (% $D_{3c}T$)
1984	0.7	0.6	2.8	17.1	1.3	1.0	3.1	24.1
2002	0.4	0.1	1.6	19.8	0.5	0.3	2.4	16.8

Between 1984 and 2002, the mean number of decayed, missing and filled permanent teeth was reduced for all age groups in both fluoridated and non fluoridated areas (Table 2.11). For example, between 1984 and 2002 the average number of decayed teeth among 12-year-olds decreased from 0.6 to 0.2 in fully fluoridated areas, and from 0.9 to 0.3 in non fluoridated areas. As well as a decrease in the number of decayed teeth, the percentage of the caries experience score attributable to untreated disease has also improved for permanent teeth among 8- and 12-year-olds. For all groups in 2002, there were fewer untreated decayed teeth than in 1984. For 8-year-olds in fluoridated areas, two thirds of recorded caries was untreated (66.7%) in 1984, this was reduced to less than half (44.8%) in 2002. The percentage of caries that was untreated decreased with age. However, for 15-year-olds in fluoridated areas there was no improvement in the proportion of caries untreated, which was 17.1% in 1984 and 19.8% in 2002. In non fluoridated areas, the proportion of caries that was untreated for this age group fell from 24.1% to 16.8%.

There was a marked reduction in the number of fillings between the two surveys. For example, 12-year-olds had half the number of fillings in 2002 compared with 1984, 1.6 down to 0.8 in fluoridated areas and 1.9 down to 1.0 in non fluoridated areas. Another very welcome change was in the reduction of the number of permanent teeth extracted due to caries seen in all age groups. In the case of 12-year-olds, there was a four-fold decrease (0.4 to 0.1) in fluoridated areas and a five-fold decrease (0.5 to 0.1) in non fluoridated areas.

For primary teeth among 5-year-olds, there has been a reduction in untreated caries levels; however as a percentage of caries experience the situation has not improved since 1984. Almost 80% of caries in the primary teeth of 5-year-olds remains untreated. Accordingly, there has been no increase in the number of filled teeth, and the reduction in the number of primary teeth extracted due to caries is in the order of 33% (0.3 to 0.2) in fluoridated areas and 25% (0.4 to 0.3) in non fluoridated areas. The Public Dental Service in RoI does not tend to target children earlier than 1st Class. It does not generally provide screening services at preschool level or in the first two years of primary school, preferring in most cases to target the permanent teeth as soon as they erupt in 1st or 2nd Class.

The changes in the patterns of treatment of permanent teeth are welcome. The reduced burden of disease in the population poses an opportunity to enhance treatment services for those with the disease, and preventive services for those at risk of developing caries.

2.12 Indicators of disadvantage status

Another main aim of this survey was to provide information on inequalities in oral health. Since the 'Black Report' on inequalities in health was published in the UK¹⁸, the association between disadvantage and ill health has been widely acknowledged. Medical card ownership by the parents of the children and adolescents examined in the survey is taken as a surrogate for disadvantage in RoI. Medical cards are issued in RoI following means testing of the applicant. They are also issued on the basis of disability; in addition, all persons over 70-years-old are eligible to hold one. For the vast majority of the age groups in the study, ownership of a medical card (MC) by the parents or guardians is an indication of low income. In NI, children and adolescents were classed as disadvantaged if their family reported being in receipt of any state low income benefits (LIB). Notwithstanding the lack of comparability of these two classification systems, it is useful to compare the pattern of caries and untreated disease between dependants of medical cardholders and others in RoI, and between those with any low-income benefit and others in NI. Comparisons between data for disadvantaged children in RoI with those in NI should be interpreted with caution. The LIB surrogate for disadvantage includes a greater proportion (38%) of the sample in NI than the MC surrogate for disadvantage (24%) in RoI (Table 1.3).

2.13 Dental caries levels in disadvantaged and non disadvantaged groups

The data presented in Figures 2.6a–2.6c illustrate the difference in caries levels (d_{3vc} mft/ D_{3vc} MFT) between dependents of medical card holders ('Disadvantaged') and others ('Non disadvantaged') in RoI and between dependents of those on low income benefits ('Disadvantaged') and others ('Non disadvantaged') in NI. Tables 2.12a and 2.12b show the same data at health board level for RoI. Data are presented only where there were at least 30 children or adolescents in a sub group. In both the figures and the tables, it is clear that in the vast majority of regions, and for most age groups in fluoridated and non fluoridated areas, caries levels tend to be higher amongst the less well off (disadvantaged). The statistical significance of the difference is considered in the multivariate analysis.

Figure 2.6a Caries experience according to disadvantage: RoI Fluoridated

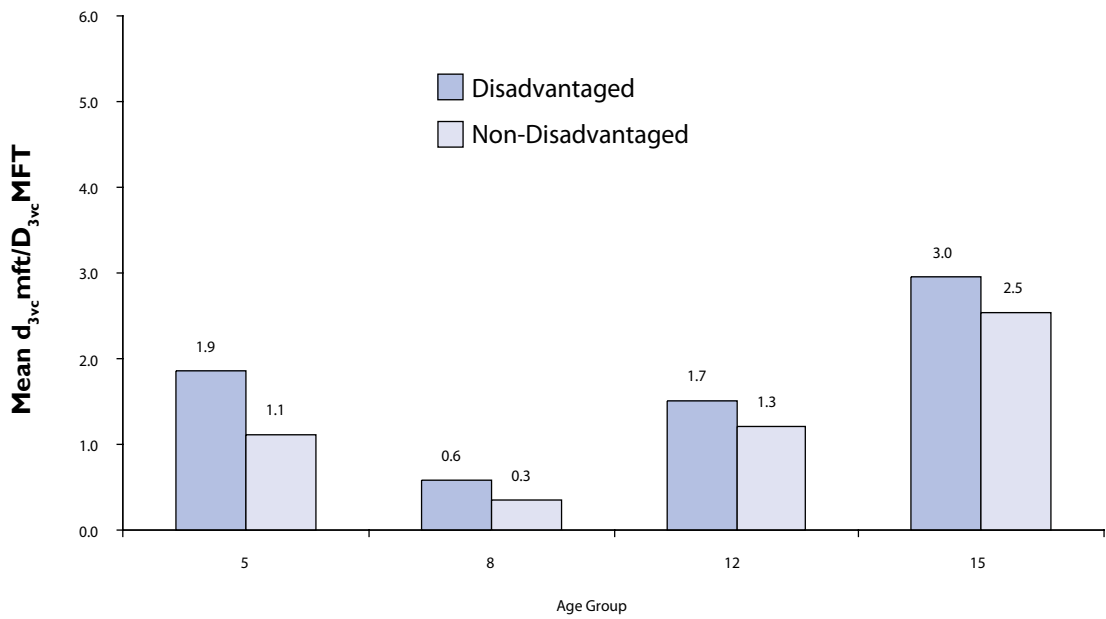


Figure 2.6b Caries experience according to disadvantage: RoI Non Fluoridated

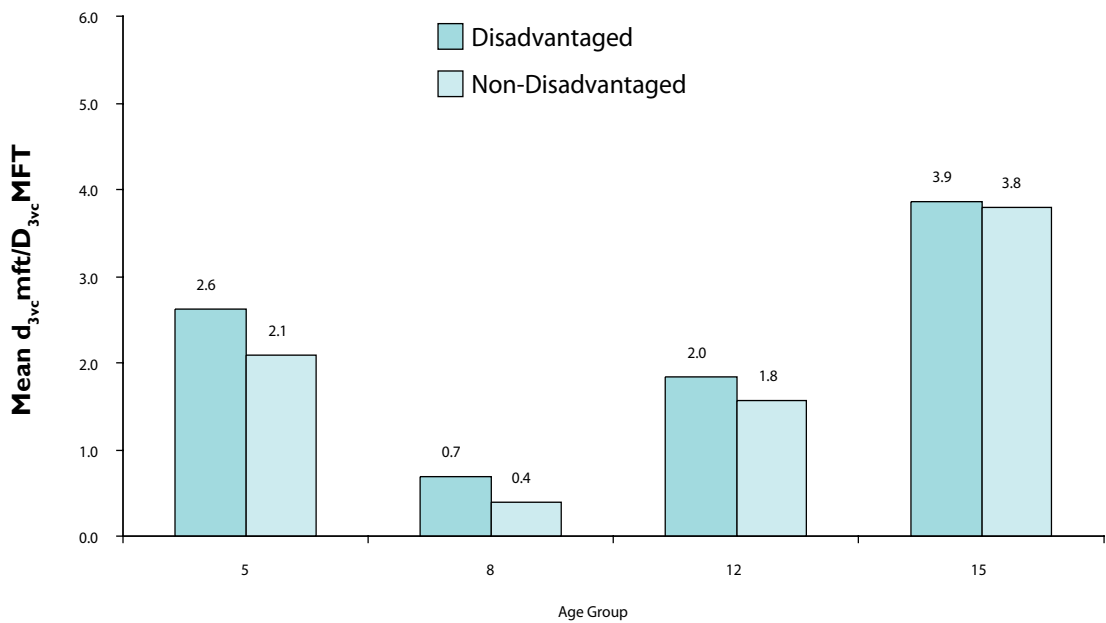


Figure 2.6c Caries experience according to disadvantage: Non Fluoridated NI

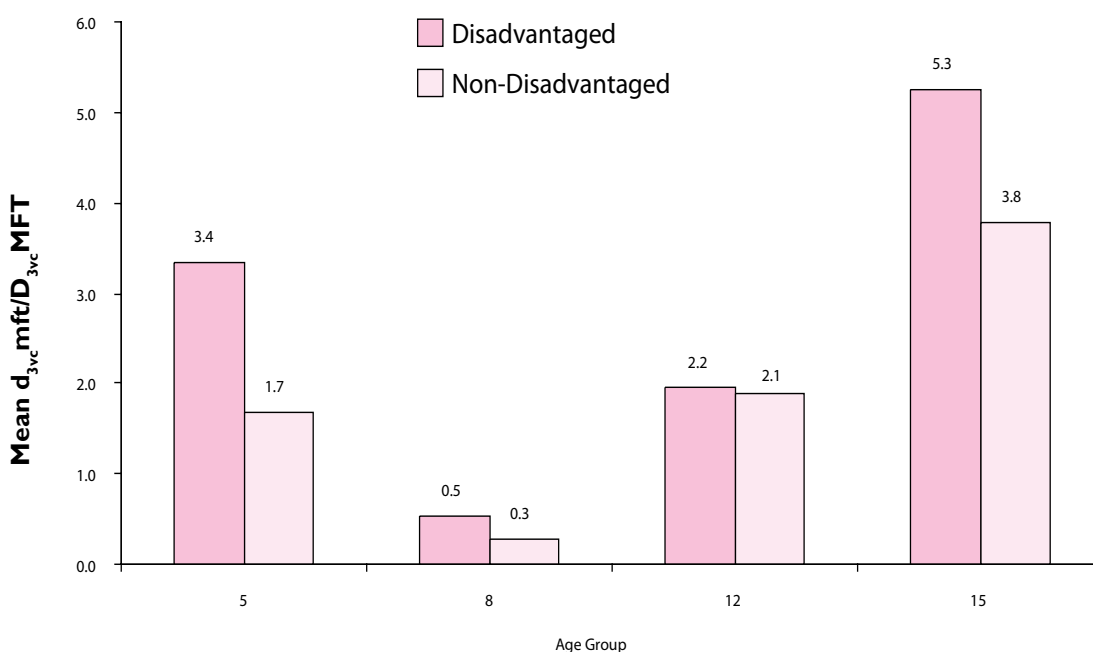


Table 2.12a Caries experience (mean $d_{3yc} mft/D_{3yc} MFT$) according to disadvantage in the health board regions: fluoridated areas

Health Board	Age 5		Age 8		Age 12		Age 15	
	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.
ERHA	1.9	0.8	0.7	0.3	1.3	1.2	3.0	2.4
ERHA-ECAHB	1.5	0.7	0.6	0.3	1.5	0.9	3.2	2.3
ERHA-NAHB	2.1	0.9	0.6	0.4	1.4	1.3	3.3	2.3
ERHA-SWAHB	2.0	0.7	0.9	0.2	1.2	1.2	2.7	2.5
MHB	2.1	1.6	0.6	0.4	2.1	1.0	2.9	2.5
MWHB	2.3	1.7	0.6	0.4	1.9	1.9	3.0	2.1
NEHB	1.9	1.3	0.5	0.6	2.5	1.2	3.0	2.8
NWHB	1.9	1.8	0.4	0.4	1.7	2.0	2.9	3.3
SEHB	2.9	1.6	0.6	0.4	2.1	1.5	3.5	2.5
SHB	1.0	1.1	0.4	0.2	1.4	1.2	2.9	2.5
WHB	1.5	1.0	0.3	0.3	2.2	1.4	2.0	2.8
Rol	1.9	1.1	0.6	0.3	1.7	1.3	3.0	2.5

Table 2.12b Caries experience (mean $d_{3yc} mft/D_{3yc} MFT$) according to disadvantage in the health board regions: non fluoridated areas

Health Board	Age 5		Age 8		Age 12		Age 15	
	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.
MHB	2.3	2.1	0.0	0.4	1.8	1.5	3.6	2.5
MWHB	3.4	2.1	1.0	0.5	2.1	1.9	4.2	4.2
NEHB	2.5	2.0	0.8	0.4	1.9	1.6	3.0	3.3
NWHB	3.2	2.2	0.9	0.4	2.1	2.1	3.9	4.0
SEHB	4.3	1.9	0.6	0.3	2.0	1.9	5.8	3.0
SHB	1.8	2.1	0.7	0.4	2.2	1.8	3.1	3.5
WHB	2.1	2.5	0.3	0.2				
Rol	2.6	2.1	0.7	0.4	2.0	1.8	3.9	3.8
NI	3.4	1.7	0.5	0.3	2.2	2.1	5.3	3.8

Table 2.13 summarises the percentage difference in caries scores (d_{3vc} mft 5-year-olds, D_{3vc} MFT 8-, 12- and 15-year-olds) in RoI between non medical cardholders (non disadvantaged) and medical card holders (disadvantaged) in fluoridated and non fluoridated areas. It also presents the percentage difference in caries scores between those with low income benefit (disadvantaged) and others (non disadvantaged) in non fluoridated NI. Taking RoI as a whole, the relative differences in d_{3vc} mft/ D_{3vc} MFT according to disadvantage are most pronounced amongst 5- and 8-year-olds. The differences are smaller among 12-year-olds. For 12-year-olds in non fluoridated NI, there is little difference in caries levels according to disadvantage. For 15-year-olds in RoI without water fluoridation, there is little difference in caries levels according to disadvantage; for those with water fluoridation the difference is 14.2%. There is a trend towards decreasing differences in caries levels according to disadvantage, as children get older.

A point worth noting is that caries levels are lower in fluoridated groups than in non fluoridated groups for both disadvantaged and non disadvantaged groups, thus fluoridation reduces caries levels across the social divide.

The data generally support the published literature, which asserts that the oral health of the less well off is worse than that of the rest of the population.

Table 2.13 Percentage difference in caries scores (mean d_{3vc} mft/ D_{3vc} MFT) between disadvantaged and non disadvantaged groups

Age Group	Full FI RoI % diff	Non FI RoI % diff	Non FI NI % diff
5	40.1	19.9	50.1
8	41.4	42.9	49.1
12	21.9	12.8	5.0
15	14.2	1.6	28.1

2.14 Caries experience according to parents' occupational classification

Information on both parents' occupations was provided in the questionnaire to parents of 8-year-olds and to 15-year-olds themselves. The occupations were coded post hoc according to the classification system used by the Central Statistics Office. Mean caries scores according to parents' occupational code are presented in Tables 2.14a (8-year-olds) and 2.14b (15-year-olds). Where occupation codes differed between a child's parents or guardians, the higher occupational classification was used. To ensure adequate numbers in each cell, the classes were grouped as follows:

- 1-Managers & Administrators with 2-Professional
- 3-Associate Professional & Technical with 4-Clerical & Secretarial
- 5-Craft & Related
- 6-Personal & Protective Service with 7-Sales and with 8-Plant & Machine Operatives
- 9-Other with Unemployed.

Mean caries scores are shown for cells with numbers greater than or equal to 30.

The occupational class scale is an ordinal scale. For 8-year-olds in fluoridated areas in RoI, there was a clear gradient in caries experience according to occupational class with children of those at the top of the scale (Managers, Administrators and Professionals) having a mean score of 0.3 compared to 0.6 for those at the lower end of the scale (Other and Unemployed). There was a similar trend in the non fluoridated areas in RoI for the top four occupational groups but the lowest group did not follow the trend. Among 8-year-olds in NI, mean caries score also increased with decreasing occupational class. Whilst there was evidence of a similar trend amongst the 15-year-old group, the picture was not as consistent. For comparison, the mean caries experience according to medical card status or low income benefit status is also presented; these surrogates are just as useful as occupational classification for identifying the less well off. They are also easier to interpret as occupations can be difficult to classify.

Table 2.14a Number and mean caries experience according to parent's occupational classification and according to disadvantage: 8-year-olds

	8- year-olds					
	Rol Full FI		Rol Non FI		NI Non FI	
	n	mean D _{3vc} MFT	n	mean D _{3vc} MFT	n	mean D _{3vc} MFT
Managers, Administrators and Professionals	665	0.3	179	0.4	54	0.3
Associate Professional & Technical, Clerical & Secretarial	454	0.3	179	0.5	43	0.3
Craft & Related	362	0.4	260	0.5	37	0.4
Personal & Protective Service, Sales, Plant & Machine Operatives	266	0.5	87	0.6	22	
Other, Unemployed	347	0.6	69	0.3	44	0.6
Non medical card holders / No low income benefits	1656	0.3	656	0.4	119	0.3
Medical card holders / Low income benefits	542	0.6	157	0.7	87	0.5
Total	2211	0.4	816	0.5	210	0.4

Table 2.14b Number and mean caries experience according to parent's occupational classification and according to disadvantage: 15-year-olds

	15-year-olds					
	Rol Full FI		Rol Non FI		NI Non FI	
	n	mean D _{3vc} MFT	n	mean D _{3vc} MFT	n	mean D _{3vc} MFT
Managers, Administrators and Professionals	577	2.4	132	4.3	130	3.4
Associate Professional & Technical, Clerical & Secretarial	423	2.5	109	3.4	65	3.8
Craft & Related	410	2.5	227	3.6	67	5.2
Personal & Protective Service, Sales, Plant & Machine Operatives	264	3.0	70	4.2	44	4.7

Other, Unemployed	322	2.8	89	4.1	69	5.2
Non medical card holders / No low income benefits	1493	2.5	456	3.8	261	3.8
Medical card holders / Low income benefits	561	3.0	175	3.9	129	5.3
Total	2062	2.6	632	3.8	396	4.3

2.15 Untreated dental caries in disadvantaged and non disadvantaged groups

Equity in the provision of oral health services is a goal of the Irish Health Board Dental Service. The data were analysed to determine whether the need for treatment of dental caries varied according to disadvantage, using the parents or guardians possession of a medical card as a surrogate for disadvantage in RoI and receipt of low income benefits as a surrogate in NI. The common measure used to compare treatment need amongst groups is the percentage of $d_{3vc}mft/D_{3vc}MFT$ attributable to the ' d_{3vc}/D_{3vc} ' component. The data are presented in Figures 2.7a (RoI fluoridated sample), 2.7b (RoI non fluoridated sample) and 2.7c (NI non fluoridated sample). Over 80% of caries in 5-year-olds in RoI is untreated, ranging from 81.6% in dependants of medical cardholders to 84.2% in the non disadvantaged group in non fluoridated areas, with a similar picture in fluoridated areas. The high unmet treatment need for caries among 5-year-old children is consistent with the usual pattern of service delivery in the Health Board Dental Service in RoI, which does not generally include provision of routine care to 5-year-old children. The pattern of unmet treatment need does not vary according to medical card status or fluoridation status. In NI, unmet treatment need among 5-year-old children whose families receive some state benefits is slightly lower in the low income group (71.9%) compared with unmet treatment need in the non disadvantaged group (76.0%). Routine dental treatment is available on demand from the General Dental Practice without charge to all children in NI.

Figure 2.7a Percentage of caries untreated according to disadvantage: Fluoridated RoI

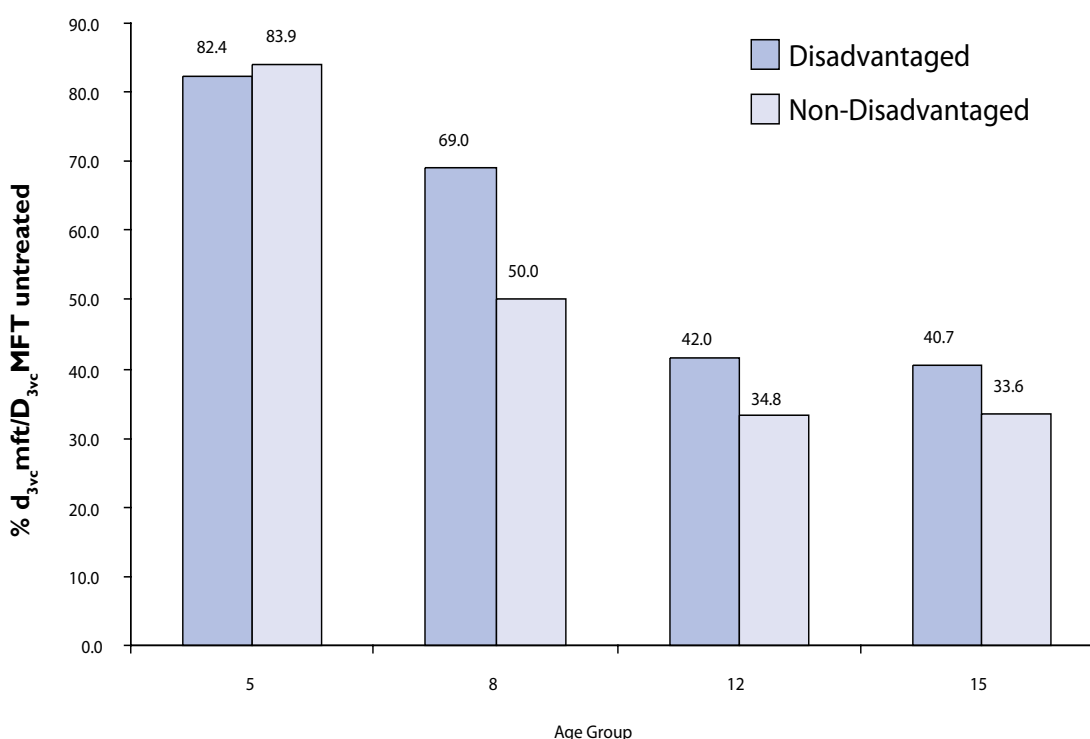


Figure 2.7b Percentage of caries untreated according to disadvantage: Non fluoridated Rol

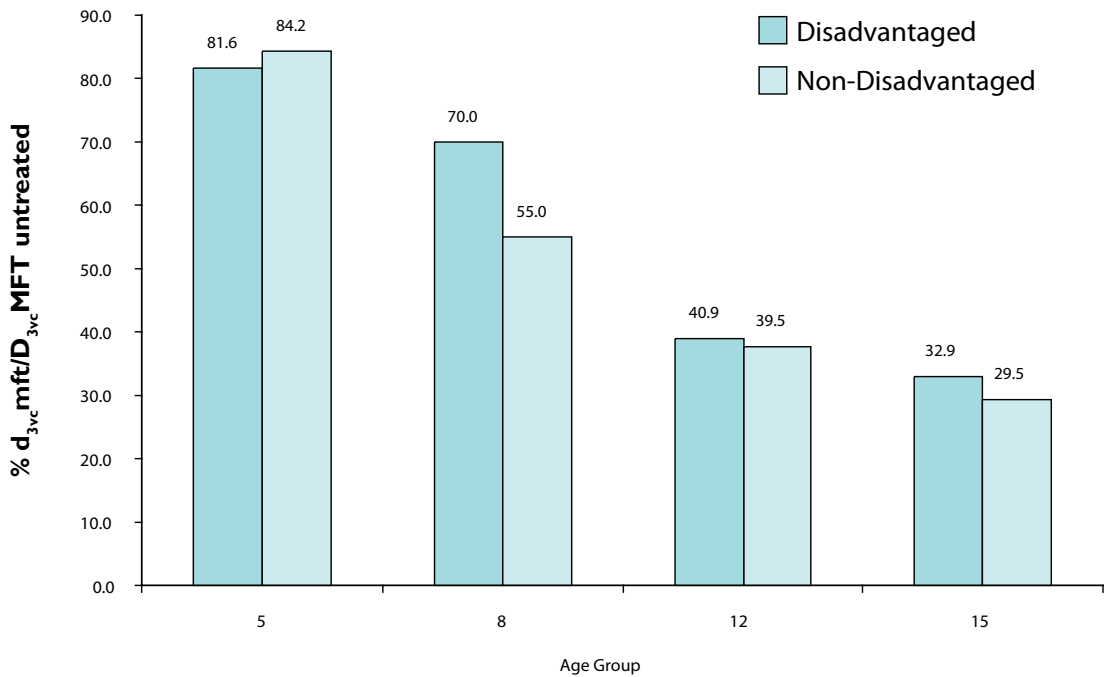
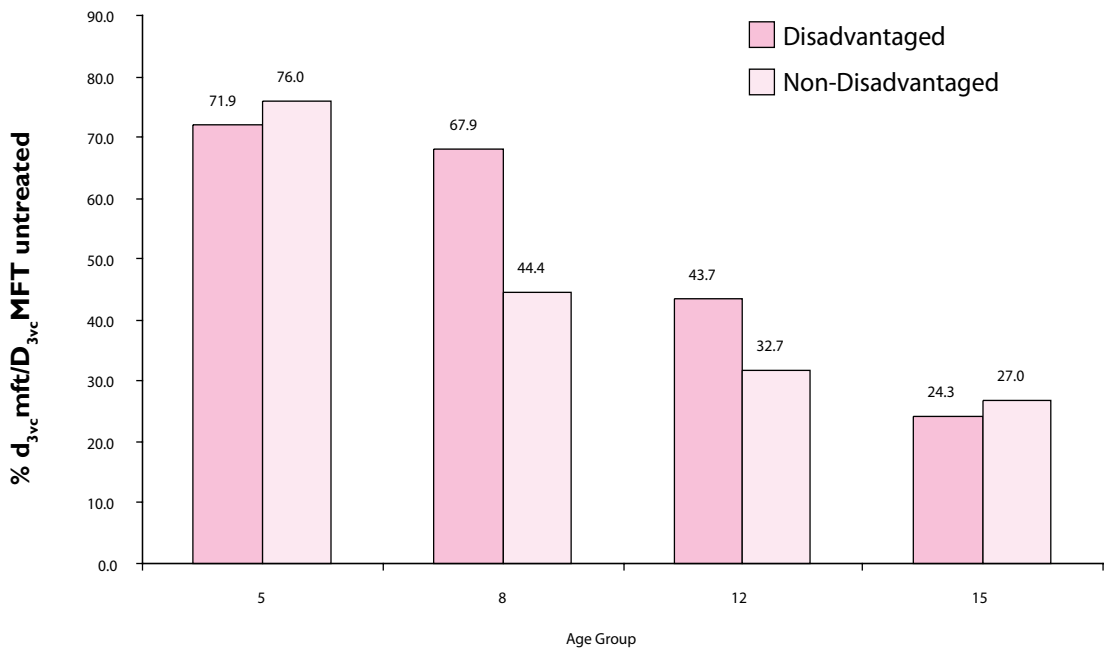


Figure 2.7c Percentage of caries untreated according to disadvantage: Non fluoridated NI



In all three figures, the proportion of caries remaining untreated tends to fall with age in both disadvantaged and non disadvantaged groups, except in the case of 15-year-olds in fluoridated areas in Rol. There was an actual increase in the volume of untreated disease between age 12 and age 15 in fluoridated areas in Rol, an important consideration when planning future services for secondary school children as adolescents up to age 16 are eligible for treatment by the Public Dental Service.

For all age groups except for NI 15-year-olds and all 5-year-old groups, the percentage of caries untreated is higher amongst the less well off. It is interesting to note this reverse in situation amongst NI 15-year-olds; in NI, adolescents can obtain free treatment from dentists in General Dental Practice. The greatest differences in the proportion of caries untreated were between the disadvantaged and

non disadvantaged groups amongst 8-year-old. For example, among 8-year-olds in fluoridated RoI, 50.0% of decay was untreated for the non disadvantaged group and 69.0% of decay was untreated for the disadvantaged group. In NI, the difference was even greater at 44.4% and 67.9%. One might expect to find low levels of unmet treatment need among 8-year-old children, as this is generally one of the target groups for the Public Dental Services. However, the fieldwork for the survey may have been carried out in the months before treatment was to be offered to this target group.

Table 2.15a (fluoridated RoI) and Table 2.15b (non fluoridated RoI) present these data by health board region.

Table 2.15a Percentage of caries untreated, according to disadvantage in the health board regions, fluoridated areas

Health Board	Age 5		Age 8		Age 12		Age 15	
	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.
ERHA	81.6	80.0	73.0	58.6	39.1	31.0	49.3	40.6
ERHA-ECAHB	91.3	82.2	47.4	56.0	50.3	30.8	40.8	46.1
ERHA-NAHB	84.4	87.1	77.8	76.3	44.6	33.3	66.9	45.2
ERHA-SWAHB	75.9	75.4	79.1	43.5	25.2	28.7	38.1	34.1
MHB	89.4	94.8	71.9	51.4	39.1	36.5	37.4	40.0
MWHB	76.7	79.9	67.2	46.3	47.4	35.4	28.5	27.7
NEHB	85.6	85.5	62.3	38.7	40.3	25.6	31.5	28.1
NWHB	77.7	92.3	88.6	97.4	60.8	58.4	45.7	50.3
SEHB	79.2	80.4	71.4	40.9	45.5	32.0	41.5	31.3
SHB	84.5	79.0	47.4	25.0	49.7	28.7	34.9	22.6
WHB	94.8	90.4	75.9	51.7	28.4	49.3	32.2	25.6
RoI	82.4	83.9	69.0	50.0	42.0	34.8	40.7	33.6

Table 2.15b Percentage of caries untreated, according to disadvantage in the health board regions, non fluoridated areas

Health Board	Age 5		Age 8		Age 12		Age 15	
	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.	Disadv.	Non Disadv.
MHB	82.3	87.6		58.5	31.5	26.9	36.5	31.7
MWHB	89.8	78.8	72.4	35.3	11.7	23.8	19.3	18.3
NEHB	77.7	85.9	76.0	58.3	40.5	42.0	53.2	22.2
NWHB	80.2	88.7	85.1	90.5	82.8	68.5	48.1	50.2
SEHB	91.7	84.3	30.5	75.8	31.5	14.7	37.9	32.3
SHB	78.1	75.1	41.1	28.6	19.2	16.9	30.6	22.4
WHB	95.3	92.8	24.1	31.6				
RoI	81.6	84.2	70.0	55.0	40.9	39.5	32.9	29.5
NI	71.9	76.0	67.9	44.4	43.7	32.7	24.3	27.0

2.16 Multivariate analysis, the impact of water fluoridation and disadvantage on caries levels

For RoI, the impact of fluoridation and disadvantage on caries levels were investigated using Generalised Linear Models (GLM) for a negative binomial distribution and a logarithmic link function. The factors included were fluoridation status of the home water supply since birth ('Full FI' and 'Non FI') and disadvantage (ownership of a medical card by the parents or child in RoI). The interaction between these two factors was also included. This method allowed the measurement of the difference in caries levels according to fluoridation status whilst controlling for disadvantage, and similarly the measurement

of differences in caries levels according to disadvantage whilst controlling for fluoridation status. The inclusion of the interaction term determines whether any difference between groups according to, for example, fluoridation status, is the same for both disadvantaged and non disadvantaged groups and vice versa.

Table 2.16 Mean number (and standard deviation) of decayed, missing and filled teeth (d_{3vc} mft 5-year-olds, D_{3vc} MFT 8-, 12-, 15-year-olds) among children and adolescents with fluoridated and non fluoridated domestic water supplies according to disadvantage (medical card ownership) in Rol in 2002 (unweighted data)

	Full FI		Non FI		Full FI vs Non FI	Disadv. vs Non Disadv.	Interaction
	mean	sd	mean	sd	p-value	p-value	p-value
5 Disadvantaged	2.0	2.9	2.6	3.4			
5 Non disadvantaged	1.2	2.2	2.0	2.8			
5 All	1.4	2.4	2.1	2.9	<0.0001	<0.0001	0.3117
8 Disadvantaged	0.6	1.1	0.7	1.2			
8 Non disadvantaged	0.3	0.8	0.4	0.9			
8 All	0.4	0.9	0.5	1.0	0.0162	<0.0001	0.6612
12 Disadvantaged	1.9	2.2	2.3	2.5			
12 Non disadvantaged	1.3	1.8	1.8	2.2			
12 All	1.5	1.9	1.9	2.2	<0.0001	<0.0001	0.7030
15 Disadvantaged	3.0	3.0	3.8	3.9			
15 Non disadvantaged	2.5	2.6	3.5	3.5			
15 All	2.6	2.7	3.6	3.6	<0.0001	0.0082	0.5898

The statistical significance of the difference in the distribution of d_{3vc} mft/ D_{3vc} MFT scores within the two fluoridation and two disadvantage groups is shown in Table 2.16. The GLM analysis is carried out on the distributions of unweighted data, and the unweighted means and standard deviations are also presented in Table 2.16. Caries levels are lower for those residing in areas with full water fluoridation in all four age groups ($p < 0.0001$ for 5-, 12- and 15-year-olds, $p = 0.0162$ for 8-year-olds). Caries levels are also lower for non medical card holders in all four age groups ($p < 0.0001$ for 5-, 8- and 12-year-olds, $p = 0.0082$ for 15-year-olds). This effect of fluoride is independent of medical card status for all four age groups ($p = 0.3117$, 0.6612 , 0.7030 and 0.5898 , respectively). Caries levels are higher amongst the less well off in Rol; however, difference in disadvantage status does not account for the difference seen due to fluoridation.

The halo effect of water fluoridation must be considered when comparing caries and fluorosis levels among children and adolescents living in adjacent fluoridated and non fluoridated areas in Rol. Those living in the non fluoridated areas are likely to consume foods and beverages manufactured, or processed, with fluoridated water in the local cities or towns. Hence, the non fluoridated Rol group probably derives some of the benefits of water fluoridation through their diet. This unknown exposure to fluoride is less in NI as the foods consumed there are unlikely to be manufactured in Rol because of the border and historical trade restrictions. The populations in Rol and NI are otherwise similar in terms of factors that might impact oral health. Comparison of caries levels and fluorosis between children and adolescents with water fluoridation in Rol and those with no exposure to environmental fluoride (no halo effect) in NI provides a further insight into the effectiveness of water fluoridation.

Using Generalised Linear Models for a negative binomial distribution and a logarithmic link function, the impact of fluoridation and disadvantage was further investigated by comparing the distribution of caries scores in the fluoridated groups in Rol with those with no water fluoridation in NI. The factors included were fluoridation status of the home water supply since birth ('Full FI' and 'Non FI') and disadvantage (ownership of a medical card by the parents or child in Rol, family receiving any low income benefits in NI (disadvantaged and non disadvantaged)). The interaction between these two factors was also included. For 5-, 12- and 15-year-olds, caries levels at the d_{3vc} mft/ D_{3vc} MFT level are higher in non fluoridated NI than in fully fluoridated Rol. These differences are significant for the three

age groups. The impact of disadvantage on dental caries levels in the fluoridated group in Rol and the non fluoridated group in NI is estimated in Table 2.17, which also presents comparison of disadvantaged and non disadvantaged groups. Caries levels are significantly higher among the less well off 5-, 8-, 12- and 15-year-olds (having controlled for fluoridation status), with statistical significance levels of $p < 0.0001$, $p = 0.0003$, $p = 0.0298$ and $p < 0.0001$ respectively. For the 8- and 12-year-old age groups, the interaction between fluoridation status and disadvantage was not significant for caries at the $d_{3vc} \text{ mft}/D_{3vc} \text{ MFT}$ level ($p > 0.05$). This means that the difference in caries at $d_{3vc} \text{ mft}/D_{3vc} \text{ MFT}$ level according to disadvantage was similar for the fluoridated group in Rol and the non fluoridated group in NI.

Table 2.17 Mean number (and standard deviation) of decayed, missing and filled teeth among children and adolescents with fluoridated domestic water supplies according to disadvantage in Rol (medical card ownership) and in non fluoridated NI (family in receipt of any low income benefits) in 2002. Statistical significance of difference between groups (p values) (unweighted data)

	Full FI Rol		Non FI NI		Full FI Rol vs Non FI NI	Disadv. vs Non Disadv.	Interaction
	$d_{3vc} \text{ mft}/D_{3vc} \text{ MFT}$	sd	$d_{3vc} \text{ mft}/D_{3vc} \text{ MFT}$	sd	p-value	p-value	p-value
5 Disadvantaged	2.0	2.9	3.4	3.8			
5 Non disadvantaged	1.2	2.2	1.7	2.5			
5 All	1.4	2.4	2.3	3.2	<0.0001	<0.0001	0.0003
8 Disadvantaged	0.6	1.1	0.5	0.9			
8 Non disadvantaged	0.3	0.8	0.3	0.7			
8 All	0.4	0.9	0.4	0.8	0.4632	0.0003	0.8016
12 Disadvantaged	1.9	2.2	2.2	2.3			
12 Non disadvantaged	1.3	1.8	2.1	2.2			
12 All	1.5	1.9	2.1	2.2	0.0001	0.0298	0.1555
15 Disadvantaged	3.0	3.0	5.3	4.1			
15 Non disadvantaged	2.5	2.6	3.8	3.5			
15 All	2.6	2.7	4.3	3.7	<0.0001	<0.0001	0.0032

Medical card / low income benefit status were used as surrogates for disadvantage in these analyses. Another approach would be to use the parents' occupational status, which was classified in the same way in Rol and NI. Occupational status was available from questionnaire data for both 8- and 15-year-olds in Rol and NI, but not for the other age groups. The multivariate analysis was rerun for 15-year-olds to determine whether the use of medical card ownership or low income benefit status instead of occupational status made a difference to the outcome. The result was the same for the Rol 'Full FI'/'Non FI' comparison. In Rol, caries levels were lower amongst 15-year-olds in fluoridated areas whilst controlling for occupational status ($p < 0.0001$), and also varied according to occupational status while controlling for fluoridation status ($p = 0.0024$); both variables were independent of each other ($p = 0.1264$). Comparing the 15-year-old 'Full FI' Rol group with the 'Non FI' NI group, fluoridation status and occupation code both had a significant effect on caries levels ($p < 0.0001$); these effects were independent of each other ($p = 0.5357$).

In general, the oral health of the less well off is worse than that of the rest of the population in both Rol and NI. The results also show that the oral health of children and adolescents resident in fluoridated areas in Rol is better than those who reside in non fluoridated areas in NI. The observed differences in these closely matched populations represent the additive caries preventive effect of a programme, which includes both water fluoridation and fluoride toothpaste (as implemented in Rol) over and above that of a programme that includes toothpaste alone (as implemented in NI).

2.17 Fluoride mouthrinsing in non fluoridated areas

School based, fortnightly fluoride mouthrinsing with 0.2% Sodium Fluoride is an effective means of controlling caries for those without water fluoridation. The first school based fluoride mouthrinse

programmes commenced in Waterford in 1967. A recent estimate¹⁷ indicated that approximately 30,000 primary school children participate in school based fortnightly fluoride mouthrinsing schemes. Children in 1st to 6th Classes in primary schools in some non fluoridated areas are invited to participate in the scheme. The programme does not continue into secondary school, as up until recently students in secondary school were no longer the responsibility of the Public Dental Service. In any case, secondary schools are generally situated in urban areas with water fluoridation, and whilst some of the students have no domestic water fluoridation, they are integrated with students who do receive fluoridated water at home, making the programme more difficult to implement. A review¹⁹ of the Waterford programmes showed that in 6th Class (age 12), caries levels of children who had participated in the rinse programme for five years (since 1st Class) were comparable to those of children with water fluoridation, and lower than those without water fluoridation in the same region. However, the review also showed that four years after leaving primary school and finishing the programme, those who had participated in the rinse programme had higher caries levels than those with domestic water fluoridation. Their caries levels were comparable to those of the same age who had never participated in the rinse programme. For this reason, some areas that used to run rinse schemes no longer do so.

In this survey, parents of the sample of children were asked about their child's fluoride history when they were completing the consent form. The question "Has your child ever taken part in a school fluoride mouth rinse scheme?" was asked. The children and adolescents were classified as 'Rinse only' if the child's home address had never had a fluoridated water supply, but the parent reported that the child had taken a fluoride mouthrinse or participated in a school fluoride mouthrinse scheme. The mean caries scores (D_{3vc} MFT) for the 'Rinse only' group are shown in Table 2.18a. Data are shown at health board level where there were more than 30 children in the 'Rinse only' category in any age group. These results are unweighted. For comparison, unweighted data are also shown for the 'Non FI' and 'Full FI' categories.

Table 2.18a Fluoride mouthrinsing: Number and mean caries score (D_{3vc} MFT) for fully fluoridated and non fluoridated groups and for those who had participated in a school fluoride mouthrinse scheme (unweighted data)

Health Board	Fluoridation Status	Age 8		Age 12		Age 15	
		n	mean	n	mean	n	mean
MHB	Rinse only	16		103	1.3	43	2.7
	Full FI	145	0.4	140	1.3	134	2.6
	Non FI	75	0.4	48	1.5	33	2.9
MWHB	Rinse only	47	0.4	67	2.1	97	2.7
	Full FI	219	0.4	224	1.8	145	2.1
	Non FI	106	0.6	101	1.7	71	4.1
SEHB	Rinse only	136	0.6	207	1.7	106	3.6
	Full FI	270	0.5	268	1.6	302	2.8
	Non FI	83	0.4	59	2.1	48	3.3
SHB	Rinse only	8		55	1.6	46	2.9
	Full FI	332	0.3	320	1.4	284	2.8
	Non FI	233	0.6	244	2.2	191	3.9
Health Board	Fluoridation Status	Age 8		Age 12		Age 15	
		n	mean	n	mean	n	mean
WHB	Rinse only	93	0.6	125	1.3	61	3.4
	Full FI	195	0.3	179	1.7	184	2.5
	Non FI	36	0.3	28		14	
TOTAL	Rinse only	315	0.6	586	1.5	389	3.2
	Full FI	2211	0.4	2089	1.5	2062	2.6
	Non FI	816	0.5	746	1.9	632	3.6

For 8-, 12- and 15-year-olds, there were 315, 586 and 389 children and adolescents respectively in the 'Rinse only' category. The SEHB region had the highest number in each age group.

Caries levels are low among 8-year-olds, and it is not useful to look for rinse effects among this age group given that they would have been rinsing for a relatively short period. Comparing the groups using two sample t-tests, for the 12-year-old group, the mean D_{3vc} MFT at 1.5 is lower in the 'Rinse only' group than in the non fluoridated group ($p=0.0004$, Table 2.18b) which had a mean score of 1.9. The score for the fully fluoridated group was not statistically significantly different to the rinse only group at 1.5 ($p>0.05$). By age 15 (Table 2.18c), the group which reportedly had taken part in the school mouthrinse programme had a mean caries score of 3.2, which was not statistically significantly lower than the caries score of 3.6 ($p>0.05$) in non fluoridated areas. However, it was statistically significantly higher than the caries score of 2.6 ($p<0.0001$) in fluoridated areas. These data indicate the effectiveness of the school fluoride mouthrinsing programmes amongst children in 6th Class (12-year-olds) and the subsequent loss in the caries protective effect of the school fluoride mouthrinse three years after its cessation in Junior Certificate year (15-year-olds). The widening of the difference between the rinse only group and the fully fluoridated group is illustrated in Figure 2.8.

Table 2.18b Mean caries score (D_{3vc} MFT) by fluoridation status for 12-year-olds

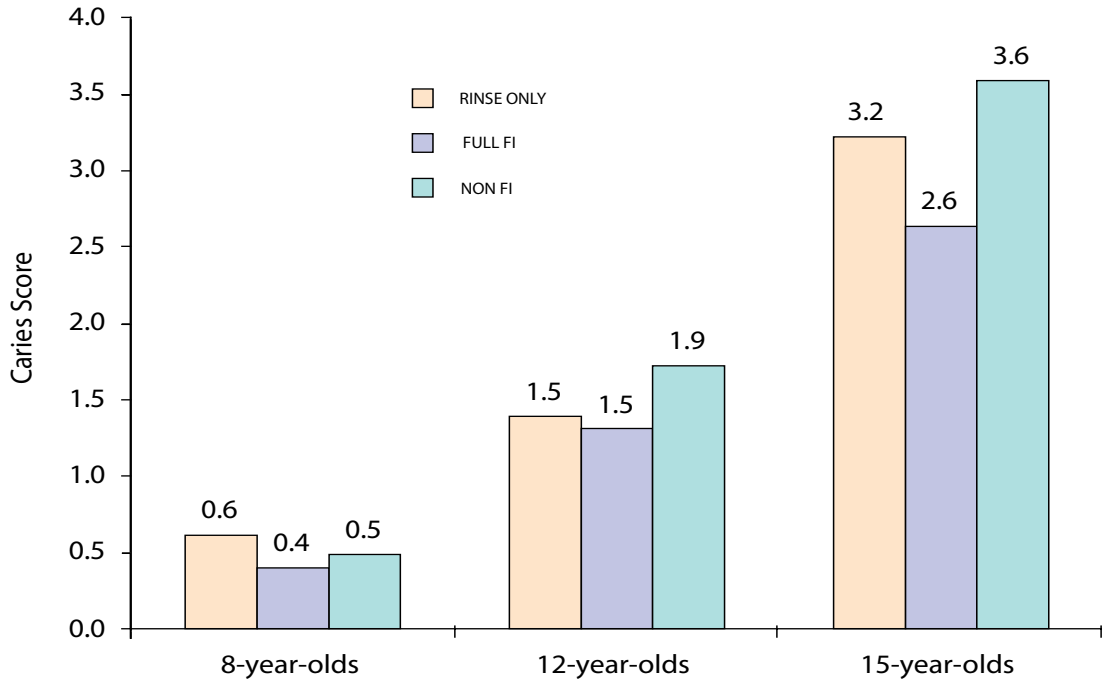
12-year-olds										
Rinse only			Full FI				Non FI			
n	mean	sd	n	mean	sd	p	n	mean	sd	p
586	1.5	1.8	2089	1.5	1.9	> 0.05	746	1.9	2.2	0.0004

Table 2.18c Mean caries score (D_{3vc} MFT) by fluoridation status for 15-year-olds

15-year-olds										
Rinse only			Full FI				Non FI			
n	mean	sd	n	mean	sd	p	n	mean	sd	p
389	3.2	2.8	2062	2.6	2.7	<0.0001	632	3.6	3.6	> 0.05

It is important to note when interpreting these data that although their home addresses were checked and coded as non fluoridated, the 'Rinse only' group's participation in an ongoing school rinse programme was not validated. In other words, the 'Rinse only' group is most likely to be composed of children who participated in a school based fluoride mouthrinse programme for varying periods of time rather than the ideal six years; therefore its effects at age 12 are possibly underestimated.

Figure 2.8 Fluoride mouthrinsing: Mean caries score (D_{3vc} MFT) by fluoridation status for full and non fluoridated groups and for those who had participated in a school fluoride mouthrinse scheme



2.18 Presence of fissure sealants

Another treatment commonly provided by the Public Dental Service is the application of fissure sealants. Teeth have two types of surface: Smooth surfaces which are particularly well protected from tooth decay by fluoride, and pitted or fissured chewing surfaces which benefit from the clinical application of a plastic adhesive resin called fissure sealant. This sealant, when successfully applied, protects these vulnerable surfaces from decay.

The percentage of children and adolescents with any fissure sealant on their teeth is presented in Table 2.19 for 8-, 12- and 15-year-old children and adolescents in the health board regions, RoI as a whole and NI. A child was considered to have sealants if there was evidence of either a complete or partial fissure sealant on one or more teeth.

Table 2.19 Percentage of children and adolescents with any fissure sealant on their teeth

Health Board	Age 8	Age 12	Age 15
ERHA	40.1	73.8	67.9
ERHA-ECAHB	55.9	81.6	72.8
ERHA-NAHB	33.4	68.3	61.8
ERHA-SWAHB	37.7	74.6	70.0
MHB	52.7	71.8	72.4
MWHB	58.6	76.8	76.8
NEHB	49.9	59.8	60.9
NWHB	31.2	46.0	43.4
SEHB	40.1	76.3	75.7
SHB	72.8	78.4	78.5
WHB	33.2	60.1	62.1
RoI	47.1	70.4	68.7
NI	32.7	54.9	57.3

In RoI, 47.1% of 8-year-olds had some fissure sealants on their teeth. In NI, the percentage of 8-year-olds with fissure sealants was 32.7%. In RoI, these results are considered reasonable, as the study may have been completed before all children in that class scheduled for treatment had been seen.

In RoI, 70.4% of 12-year-olds and 68.7% of 15-year-olds had some fissure sealants on their teeth. In NI, the percentages were 54.9% and 57.3% for 12- and 15-year-olds respectively. This finding is interesting because of the differences in the system of delivery of dental care in the two regions. In NI, the oral health care services are largely demand led, with the Community Dental Service (CDS) encouraging parents to register their children with a General Dental Practitioner (GDP) for oral health care services. In RoI, the service is closer to a needs led service: In most areas the Public Dental Service screen children up to age 12 in primary school and subsequently send appointments for clinical dental services to those for whom consent has been obtained. In many areas, the services target the 8- to 12-year-old group when they are in 1st or 2nd, 6th and sometimes 4th Classes. Adolescents in secondary school from age 12 to 16 are also eligible for services. Differences in the method of service delivery may account for the higher prevalence of fissure sealants among children and adolescents in RoI.

There was considerable variation amongst the health boards in the proportion of 8-year-olds with fissure sealants on their teeth. However, as the prevalence among this group is closely linked to the timing of the survey, it is not possible to draw inferences from the variation. In the older age groups, there was less variation in most regions in RoI. At least 59.8% of 12-year-olds and at least 60.9% of 15-year-olds had some fissure sealants on their teeth. The notable exception was the NWHB region where 46.0% of 12-year-olds and 43.4% of 15-year-olds had some fissure sealants on their teeth. The most likely explanation for this disparity would appear to be the difficulties encountered in filling the dental posts in Donegal (NWHB) where there was a consistent difficulty in recruiting dentists in the years prior to the survey.

The data were also analysed to determine whether there was equity in the delivery of fissure sealants to children and adolescents. Table 2.20 shows the prevalence of fissure sealants according to disadvantage.

Table 2.20 Percentage of children and adolescents with at least one fissure sealant according to disadvantage status

Health Board	Age 8		Age 12		Age 15	
	Disadvantaged	Non Disadvantaged	Disadvantaged	Non Disadvantaged	Disadvantaged	Non Disadvantaged
ERHA	36.0	41.4	63.5	75.9	64.8	68.7
ERHA-ECAHB	67.1	54.3	64.1	83.2	70.1	74.1
ERHA-NAHB	21.7	35.6	56.8	71.5	52.6	64.8
ERHA-SWAHB	31.9	39.5	68.9	76.0	71.6	69.0
MHB	44.0	55.1	74.0	71.1	71.9	72.4
MWHB	43.6	64.3	65.2	80.2	70.4	77.9
NEHB	45.0	52.6	57.5	60.6	58.1	61.9
NWHB	29.0	30.4	45.2	44.4	48.3	39.1
SEHB	35.4	41.6	63.7	79.9	69.2	77.6
SHB	62.5	74.9	78.1	78.2	71.2	80.7
WHB	24.6	36.2	40.1	67.2	61.2	63.8
Total	40.3	49.1	62.3	72.4	65.2	69.6
NI	25.7	38.5	48.0	57.5	55.7	58.1

Compared with the rest of the sample, there were fewer children with at least one fissure sealant on their teeth among the disadvantaged group in RoI ($p < 0.0001$ for 8- and 12-year-olds, $p = 0.0001$ for 15-year-olds). In NI, for those on LIB the difference was statistically significant for the 8-year-old group only ($p = 0.022$). The difference was not significant for 12- and 15-year-olds. Among the NI 15-year-old group, although fewer adolescents had sealants compared to RoI, there appeared to be greater equity in their distribution. It is usual for the Public Dental Service in RoI to screen and invite children

to attend for treatment regardless of medical card status or disadvantage. Lower uptake of services among the more disadvantaged group may account for the differences seen in the 8- and 12-year-old groups in Rol.

Thus in Rol, the less well off experience more decay and are generally less likely to have fissure sealants on their teeth. Such findings should be addressed in the design of programmes for the delivery of care to disadvantaged groups. Alternative methods of delivery of care for these groups may reduce this inequality. Pilot studies to evaluate the impact of such interventions on treatment levels are recommended.

Table 2.21 Mean number of teeth with sealants (unweighted data)

	Age 8	Age 12	Age 15
Rol	1.6	2.6	3.1
NI	0.9	2.1	2.5

Table 2.21 indicates the mean number of sealants present. In both jurisdictions, the number increases with age, as does the number of teeth with pits and fissures. The higher proportion of children and adolescents with sealants present in Rol is reflected in the higher mean number of sealants recorded.

Although fissure sealants provide protection against decay in pits and fissures of teeth whilst they are in place, once the sealants wear away or are lost, the teeth are vulnerable once again. Maintenance of this preventive treatment on an ongoing basis would be a worthwhile service objective. The quality of the equipment used, the skill and expertise of the operator and the cooperation of the patient can affect the duration of retention of sealants. Periodic auditing of sealant retention and effectiveness is one approach to identifying areas that could benefit from intervention to improve sealant effectiveness and contribute to service efficiency.

2.19 Need for dental treatment

After recording the condition of each tooth surface, the examiner recorded the treatment need for the tooth. The recorded treatment need reflects the examiner's subjective judgement based on their clinical survey examination. These data provide an estimate of treatment need, however, as the teeth were examined wet and in the school setting, albeit with good lighting and visual access, the real treatment need is likely to be underestimated by this method. For ease of interpretation, the data were categorised into the main treatment types during analysis and are summarised here (Table 2.22).

Table 2.22 Percentage of children with need for any treatment, any filling, any fissure sealant, any extraction, any advanced restoration, and any other treatment, by age group and fluoridation status (primary teeth for 5-year-olds, permanent teeth for 8-, 12- and 15-year-olds) in Rol and NI

Treatment Need	5-year-olds		
	Rol Full FI	Rol Non FI	NI Total
	%	%	%
Any treatment	30.5	45.4	43.9
Any filling	28.1	43.4	41.2
Any fissure sealant	1.2	0.7	0.5

Treatment Need	5-year-olds		
	RoI Full FI	RoI Non FI	NI Total
	%	%	%
Any extraction	5.9	9.2	7.1
Any advanced restoration	1.6	4.0	4.1
Any other treatment	0.2	0.6	2.4

Treatment Need	8-year-olds		
	RoI Full FI	RoI Non FI	NI Total
	%	%	%
Any treatment	48.1	52.5	48.8
Any filling	14.5	17.1	17.5
Any fissure sealant	41.8	45.1	42.9
Any extraction	0.7	1.0	0.7
Any advanced restoration	0.6	0.7	0.0
Any other treatment	0.0	0.0	0.7

Treatment Need	12-year-olds		
	RoI Full FI	RoI Non FI	NI Total
	%	%	%
Any treatment	45.3	48.2	44.5
Any filling	26.5	33.2	37.3
Any fissure sealant	28.1	30.8	12.7
Any extraction	1.4	1.4	3.2
Any advanced restoration	1.1	2.3	2.6
Any other treatment	0.1	0.5	0.6

Treatment Need	15-year-olds		
	RoI Full FI	RoI Non FI	NI Total
	%	%	%
Any treatment	58.6	56.5	50.9
Any filling	41.6	48.2	45.7
Any fissure sealant	33.8	19.4	11.2
Any extraction	1.9	1.7	3.0
Any advanced restoration	2.9	1.9	2.2
Any other treatment	0.8	0.5	0.2

The treatment needs recorded were not mutually exclusive. Children and adolescents could have needed more than one type of treatment.

The need for any treatment among 5-year-olds in the fluoridated areas in RoI were lower than in the non fluoridated areas in RoI and in the whole sample in NI. In the fluoridated areas in RoI, 30.5% of 5-year-olds needed some treatment, compared to 45.4% and 43.9% respectively in the other two groups. Given the low levels of treatment in this group as illustrated earlier in this chapter, this difference is probably due to differences in disease levels rather than in access to treatment. Most of the need in this age group was for fillings. However, the percentage needing extractions is worth mentioning. Approximately 5.9% of 5-year-old children in fluoridated areas of RoI, 9.2% in non fluoridated areas of RoI, and 7.1% in NI needed at least one extraction. Premature loss of primary teeth due to caries can pose problems for alignment or loss of space for the permanent dentition. Tooth extraction can be a traumatic experience for some children and can lead to dental anxiety later on. Whilst some children are referred for extractions under general anaesthesia, this approach has its own risks and avoidance by prevention of the problem in the first instance is preferable.

Among the 8-year-old group, the most commonly needed treatment was fissure sealing. This is to be expected as the first permanent molar teeth are relatively newly erupted. The need for fillings was slightly lower in the fluoridated group (14.5%) when compared with the non fluoridated RoI sample (17.1%) and with NI (17.5%). Although the need for extractions was low (0.7% to 1.0%), this figure refers to permanent teeth that have not been in the mouth for a long period of time, and indicates the need for preventive intervention well before a child reaches eight years.

The most common treatment requirement for 12-year-olds was 'any filling', with 26.5% in fully fluoridated RoI, 33.2% in non fluoridated RoI and 37.3% in NI needing at least one filling. There was also extensive need for fissure sealants in this age group. The need for extractions was lower in RoI at 1.4%, however 3.2% of 12-year-olds in NI required extraction of at least one permanent tooth.

Need for filling was very common amongst the 15-year-old group with over 40% requiring at least one filling. There was also a considerable need for fissure sealants. The need for extractions was similar to that in the 12-year-old group.

Perhaps the most interesting feature of these data is the similarity between the treatment needs between the non fluoridated RoI sample and the NI sample. The systems of delivery of dental care are fundamentally different between the two jurisdictions. In NI, services are provided largely through the General Dental Service, supported by the Public Dental Service. Patients under 18 may have dental treatment provided free of charge by any General Dental Practitioner on the Dental List, providing the practitioner is willing to accept the patient under General Dental Services. Parents are actively encouraged to bring their children to see the dentist as early in the child's life as possible, and to establish a pattern of regular dental visiting. To stay registered, a child must visit the dentist at least every 15 months. The dentist is paid an annual capitation fee for each registered child. In RoI, services are provided through the salaried Public Dental Service and commonly children are seen in school in either 1st (age 7) or 2nd (age 8) and 6th (age 12) Classes. In many areas, children are also seen at a third point in between these two times. The service to adolescents between age 12 and 16 varies from area to area but is largely of an 'on demand' or emergency nature, as services for primary school children are prioritized. Hence, although the two systems are fundamentally different, there appears to be little difference in the outcome. In both jurisdictions, there are extensive unmet treatment needs among all age groups. The need is particularly great amongst 15-year-olds, however if the needs were addressed at a younger age, there would be less accumulation of need by age 15.

Treatment needs are presented by health board region in Tables 2.23a (any treatment), 2.23b (filling), 2.23c (fissure sealant) and 2.23d (extraction). There is wide variation amongst the regions. Overall the needs appear highest in the NWHB region, this is likely to be a reflection of the difficulty in recruiting dentists to work in the Public Dental Service in the region.

Table 2.23a Percentage of children with any treatment need by age group and fluoridation status (primary teeth for 5-year-olds, permanent teeth for 8-, 12- and 15-year-olds) by health board region

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
	%	%	%	%	%	%	%	%
ERHA	20.7		53.1		47.5		65.4	
ERHA-ECAHB	8.6		33.0		34.0		63.7	
ERHA-NAHB	15.9		41.1		41.2		61.4	
ERHA-SWAHB	30.0		73.7		59.6		69.5	
MHB	40.8	44.7	54.0	58.2	41.9	35.5	88.3	84.4
MWHB	37.4	49.8	58.9	59.7	52.6	45.9	41.1	47.5
NEHB	39.2	48.1	55.7	49.7	46.5	53.5	57.8	68.8
NWHB	38.5	42.1	71.6	82.3	74.6	76.8	61.1	64.2
SEHB	43.8	44.9	58.4	53.7	47.9	50.0	69.9	64.7
SHB	30.4	40.6	14.8	17.5	22.3	18.3	36.3	40.9
WHB	33.6	51.7	38.7	46.3	50.1		46.5	
Rol	30.5	45.4	48.1	52.5	45.3	48.2	58.6	56.5

Table 2.23b Percentage of children with any need for filling by age group and fluoridation status (primary teeth for 5-year-olds, permanent teeth for 8-, 12- and 15-year-olds) by health board region

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
	%	%	%	%	%	%	%	%
ERHA	18.4		14.3		22.5		45.7	
ERHA-ECAHB	8.0		8.4		17.1		37.4	
ERHA-NAHB	14.8		18.6		25.1		48.4	
ERHA-SWAHB	26.1		13.7		23.0		48.0	
MHB	38.2	39.8	12.9	15.6	24.0	24.4	43.2	40.2
MWHB	36.0	49.8	17.0	19.5	37.7	24.2	32.7	47.5
NEHB	36.9	45.3	13.2	16.1	22.0	31.6	44.3	43.8
NWHB	36.9	41.0	28.2	26.5	51.6	65.0	55.0	61.6
SEHB	41.2	43.3	18.2	15.3	30.6	22.1	45.2	46.3
SHB	28.4	39.4	10.0	10.0	20.6	13.9	29.6	33.2
WHB	29.4	49.3	10.9	5.0	31.5		37.3	
Rol	28.1	43.4	14.5	17.1	26.5	33.2	41.6	48.2

Table 2.23c Percentage of children with any need for fissure sealant by age group and fluoridation status (primary teeth for 5-year-olds, permanent teeth for 8-, 12- and 15-year-olds) by health board region

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
	%	%	%	%	%	%	%	%
ERHA	2.3		46.9		33.8		47.1	
ERHA-ECAHB	0.0		29.9		20.1		57.7	
ERHA-NAHB	0.0		30.5		24.2		29.6	
ERHA-SWAHB	4.9		69.6		48.6		55.0	
MHB	0.7	3.0	48.8	55.1	20.5	16.2	82.1	78.3

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
	%	%	%	%	%	%	%	%
MWHB	0.0	0.4	53.4	46.6	25.0	31.8	14.9	1.2
NEHB	0.1	0.1	53.8	44.1	31.0	29.2	30.9	45.7
NWHB	0.0	0.0	67.4	75.3	66.1	69.4	5.1	18.3
SEHB	0.0	0.0	50.2	46.4	30.3	26.6	44.1	41.4
SHB	0.0	0.0	5.7	7.0	2.5	1.5	7.5	14.4
WHB	3.6	6.7	33.8	41.3	27.9		10.6	
Rol	1.2	0.7	41.8	45.1	28.1	30.8	33.8	19.4

Table 2.23d Percentage of children with any need for extraction by age group and fluoridation status (primary teeth for 5-year-olds, permanent teeth for 8-, 12- and 15-year-olds) by health board region

Health Board	Age 5		Age 8		Age 12		Age 15	
	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI	Full FI	Non FI
	%	%	%	%	%	%	%	%
ERHA	2.8		0.6		1.3		2.0	
ERHA-ECAHB	1.0		0.5		0.0		0.4	
ERHA-NAHB	4.0		0.6		2.9		3.2	
ERHA-SWAHB	3.0		0.7		0.4		1.9	
MHB	14.3	15.5	1.4	3.1	3.3	1.8	4.1	0.0
MWHB	9.9	7.2	0.0	0.0	2.5	1.4	2.2	0.6
NEHB	10.1	10.6	2.8	0.6	3.3	0.8	0.0	1.7
NWHB	4.7	2.9	0.9	1.8	0.0	2.4	5.7	3.0
SEHB	7.5	11.7	0.5	0.0	0.7	1.0	1.6	0.0
SHB	6.0	10.7	0.2	0.6	0.9	1.5	1.3	3.7
WHB	5.4	6.7	0.4	0.0	1.3		1.4	
Rol	5.9	9.2	0.7	1.0	1.4	1.4	1.9	1.7

2.20 European comparisons

Caries levels among 12-year-olds in Rol and NI are presented with those reported from different European countries and the USA in Table 2.24 alongside data²¹ on three important risk factors in these countries. The three risk factors are frequency of drinking soft drinks sweetened with sugar; the frequency of eating sweets and the frequency of brushing teeth. The data are represented as answers to three questions:

1. “How many times a week do you usually drink Coke or other soft drinks that contain sugar?”
2. “How many times a week do you usually eat sweets (candy or chocolate)?”
Response options to 1) and 2) were: Never; Less than once a week; Once a week; 2–4 days a week; 5–6 days a week; Once a day, every day; Every day, more than once.
3. “How often do you brush your teeth?”
Response options to 3) were: More than once a day, Once a day, At least once a week but not daily, Less than once a week.

The rationale for the choice of these variables is that frequent consumption of foods or drinks sweetened with sugar causes dental caries, and brushing twice daily or more often with fluoride toothpaste is more effective in decay prevention than once daily or less.

Table 2.24 Caries levels recorded in Ireland and other countries using WHO or comparable criteria ($d_{3c}mft/D_{3c}MFT$) by dietary and oral hygiene habits of 13-year-olds in these countries (WHO, 2004²⁰)

Country	Year	Age 12	Age 13					
			daily soft drinks %		daily sweets %		brush more than 1/day %	
			F%	M%	F%	M%	F%	M%
Republic of Ireland Full FI	2002	1.2	34	41	50	48	67	54
England²¹	2003	0.7	35	40	31	32	82	66
Wales²¹	2003	1	39	39	28	27	78	59
Scotland²²	2004/'05	1.3	45	52	48	49	77	60
Austria²³	2002	1	17	23	25	19	73	65
Belgium (Flanders)²³	2001	1.1	32	50	24	33	55	39
Denmark²³	2002	0.9	8	15	14	12	83	74
Finland²³	2000	1.2	6	11	10	11	51	29
Germany²³	2000	1.2	27	36	29	26	83	70
Greece²³	2000	2.2	14	25	19	17	57	37
Italy²³	2001/'02	1.5	20	29	41	41	81	60
Netherlands (The Hague)²³	2002	0.8	41	58	36	42	81	68
Norway²³	2000	1.5	16	26	17	18	86	75
Poland²³	2000	3.8	18	29	35	33	80	53
Spain²³	2000	1.1	26	38	25	21	61	36
Sweden²³	2002	1.1	8	21	14	17	87	78
Switzerland (Zurich)²³	2000	0.9	29	43	32	28	90	77
USA²³	1999–2002	1.8	40	47	34	29	81	64
HBSC Average²⁰			26	35	30	28	73	52

As shown above, oral health of Irish children with fluoridated water supplies is favorably ranked when compared with other countries. The median $D_{3c}MFT$ of the countries listed in Table 2.24 is a score of 1.1. The caries score for the 12-year-old sample living in fluoridated areas in ROI is 1.2. However, the risk factors for caries are unfavourable for Irish children as reported by the HBSC survey. Daily (or more often) soft drink and sweet consumption were well above the average for the whole HBSC survey (35 countries). Of the 35 countries surveyed, Ireland ranked second for daily sweet consumption in this

age group; of the 18 countries presented here (Table 2.24) they ranked highest for females and second highest for males. Tooth brushing frequency (twice daily or more often) was lower than the HBSC average for girls (67% compared to 73%) and similar to the HBSC average for boys (54% compared with 52%). Given these relatively unfavorable habits, the level of dental caries in Ireland is remarkably low; this is likely to be due to the fluoridation of water supplies.

Cultural differences leading to differences in dietary habits could have contributed to the variation in caries levels seen in Table 2.24. The countries with the greatest proximity both geographically and culturally to Ireland are England, Scotland and Wales. Among these countries, RoI has almost the highest frequency of daily consumption of sweets and soft drinks, and the lowest frequency of at least twice daily tooth brushing.

Historically, caries levels among those living in fluoridated areas in RoI were lower than those in the UK countries. In the early 1980s (Figure 2.9a), caries levels were lower in fluoridated areas in RoI than they were in the UK, with the exception of 5-year-olds. For 8- and 12-year-olds in non fluoridated areas, caries levels were similar to UK children. They were higher for 5-year-olds and lower for 15-year-olds. By 2002/2003, the situation had changed (Figure 2.9b).

Figure 2.9a Cavitated caries ($d_{3c}mft/D_{3c}MFT$) levels among children and adolescents in RoI in 1984 and UK in 1983

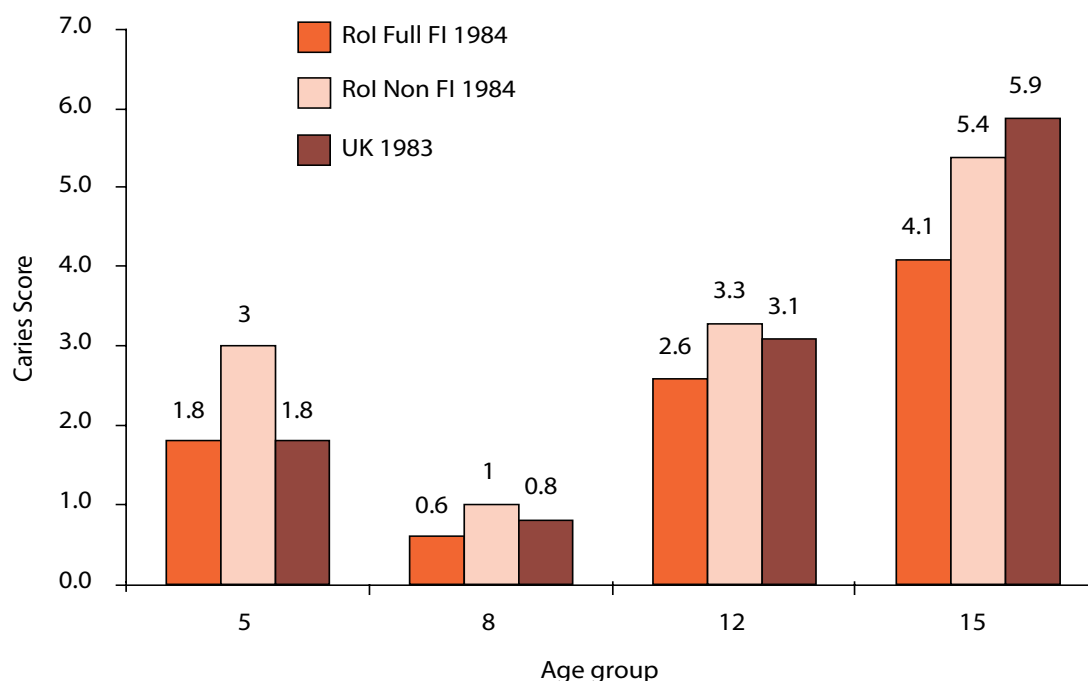
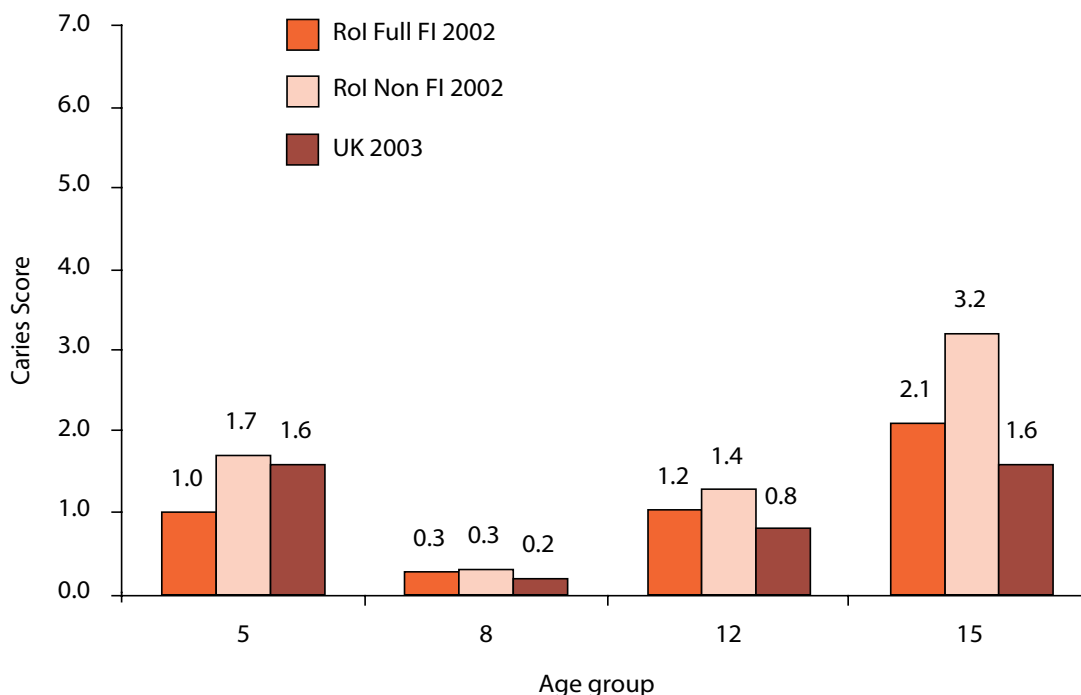


Figure 2.9b Cavitated caries ($d_{3c}mft/D_{3c}MFT$) levels among children and adolescents in RoI in 2002 and UK in 2003



Caries levels were lower in all age groups in 2002/2003 than in 1983/1984. However, with the exception of the 5-year-old group, caries levels were lower among children and adolescents in the UK than among those in both fluoridated and non fluoridated areas in RoI. The difference is particularly obvious among 15-year-olds for whom caries scores in the UK are half of those in non fluoridated areas in Ireland. Interestingly, the difference among the 5-year-old group is in the other direction: Caries scores were similar between children in the UK and children residing in non fluoridated areas in RoI, and lower among children in fluoridated areas.

It is worth noting that the differences observed among these countries cannot be explained by the differences in the use of fissure sealants. To the contrary, fissure sealants were found more often on the teeth of RoI children (Table 2.25) where 69% of 15-year-olds had some sealant on their permanent teeth, in comparison to England where this figure was only 28%.

Table 2.25 Percentage of children and adolescents with any fissure sealant on permanent teeth in RoI and NI in 2002 and in UK, England, Wales and NI in 2003

	% with any fissure sealant		
	8-year-olds	12-year-olds	15-year-olds
RoI (All) 2002	47	70	69
NI 2002	33	55	57
UK 2003	13	25	30
England 2003	11	22	28
Wales 2003	17	25	31
NI 2003	32	40	49

These data indicate that caries levels in RoI have not improved as much as those in the UK in the last two decades. In 1984, caries levels in fluoridated areas were lower than those in the UK; in 2002 they were substantially higher. To reduce caries levels to a comparable level to those in the UK, there is an urgent need to support initiatives in Ireland to increase the frequency of use of fluoride toothpaste and to reduce the frequency of consumption of sweets.

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Chapter 3

Enamel Fluorosis in Permanent Teeth

3.1 Summary

- The prevalence of fluorosis was higher in fluoridated communities in Rol in 2002, than that recorded in non fluoridated communities in Rol and in non fluoridated NI ($p < 0.05$).
- The prevalence of fluorosis is similar in disadvantaged and non disadvantaged groups.
- The prevalence and severity of fluorosis has increased in Rol between 1984 and 2002.
- In Rol, there is no clear association in these data between the ages at which children begin having their teeth brushed or brush their teeth themselves and fluorosis. In NI, there seems to be a weak positive association between age at which brushing commenced and fluorosis.
- Using multivariate analysis, fluorosis was higher amongst lifetime residents of fluoridated communities and amongst females.

3.2 Introduction

Enamel fluorosis has been defined as a dose-response effect caused by excess fluoride ingestion during the pre-eruptive development of teeth. The anterior teeth are vulnerable up to age 5. This change in the enamel surface is characterised by an altered appearance, ranging from the more common fine white lines or patches to the less frequently occurring hypoplasia, pitting of the enamel surface and a change in tooth morphology in more severe forms. The latter less frequently occurring appearance is found in countries with high naturally occurring water fluoride levels and is rarely, if ever, encountered in Ireland.

As fluoride has beneficial effects (Chapter 2), the extent to which enamel fluorosis is considered by a population to be a public health issue will be best evaluated by offsetting the benefits against the risks. The risks associated with dental decay are that it may result in the loss of teeth, is costly to treat, can be aesthetically disfiguring, and is painful. For some children, decay may give rise to the need for general anaesthesia for treatment. Fluoride can reduce dental decay, and a certain level of enamel fluorosis may enhance the appearance of teeth. A population's concern about the occurrence of enamel fluorosis must be weighed against their level of concern about the occurrence of tooth decay.

The literature has shown that there is a public awareness of enamel opacities, including enamel fluorosis. However, awareness must not be assumed to be dissatisfaction. Fine white lines or small opacities are unlikely to be apparent during social intercourse. There is evidence to suggest that a level of mild fluorosis is considered to be more aesthetic than no evidence of fluorosis¹. Research is currently underway to assess the cosmetic impact of mild enamel fluorosis in an Irish context. This work is being carried out by The Oral Health Services Research Centre in University College Cork and is funded by the Irish Health Research Board.

Measurement of enamel fluorosis is a recognised method of monitoring the total intake and absorption of fluoride from different sources. In this study, enamel fluorosis was recorded using an index called Dean's Index². This index classifies fluorosis by six grades (see Table 3.1), namely Normal (no fluorosis), Questionable, Very Mild, Mild, Moderate and Severe. The permanent teeth of 8-, 12- and 15-year-old children were examined for such fluorosis. In many instances (in the results to follow), there were no cases of severe fluorosis, hence this category is sometimes excluded from the tables.

Fluorosis is not the only cause of visual change in enamel. In order to measure these various visual changes in the appearance of enamel, an index called Developmental Defects of Enamel Index (DDE)³ was used. Using this index, the changes in enamel, in this case called opacities, are classified into six categories (Table 3.2), namely Demarcated Opacity, Diffuse Opacity, Hypoplastic Enamel and their combinations Demarcated/Diffuse, Demarcated/Hypoplastic and Diffuse/Hypoplastic. As a general rule of thumb, dental fluorosis falls into the Diffuse Opacity category.

Many of the results reported in this chapter have been published in an international peer reviewed journal^{4,5}, to which the reader is referred. The prevalence data for fluorosis, and for enamel opacities, are presented for Rol by fluoridation status and for the NI non fluoridated sample. Data are also

presented by disadvantage status within fluoridation status for RoI and NI. Historical comparisons with the previous national survey in 1984 are also presented. The final sections of the chapter focus on the prevalence of fluorosis and enamel opacities in RoI and NI. Results are presented according to the age at which toothbrushing commenced as reported by parents of 8-year-olds, and also according to whether they noticed white marks on their child's front teeth. The prevalence of fluorosis and enamel opacities is also presented for 15-year-olds according to whether they noticed white marks on their own front teeth.

3.3 Fluorosis in the Republic of Ireland and Northern Ireland in 2002

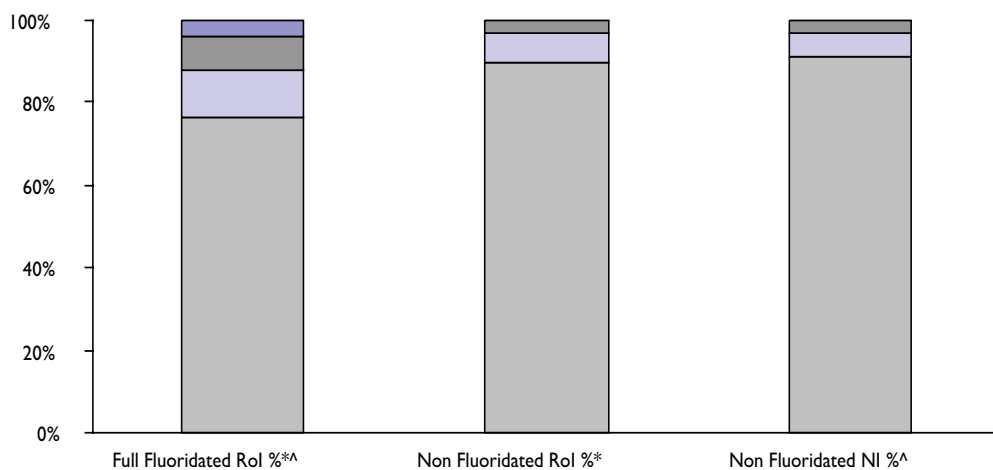
The prevalence of fluorosis in fluoridated communities in RoI in 2002 was higher than that recorded in non fluoridated communities in RoI and in non fluoridated NI ($p < 0.05$) (Table 3.1). Amongst 8-year-olds in fluoridated communities, 77% had 'normal' enamel, 12% had 'questionable' fluorosis, 8% had 'very mild' fluorosis and 4% had 'mild' fluorosis. The corresponding figures for 8-year-old residents of non fluoridated communities in RoI were 90%, 7%, 3% and 0%, and in non fluoridated NI the figures were 90%, 6%, 3% and 0% respectively. A similar pattern is apparent for 12-year-olds and 15-year-olds.

Combining the prevalence figures for the more visible forms of fluorosis (i.e. other than 'questionable'), the percentage of 12-year-olds in fluoridated communities affected by 'very mild' and higher categories combined was 16%, compared with 6% and 9% in non fluoridated communities in RoI and NI respectively. Thus, the prevalence of the more visible forms of fluorosis is higher in fluoridated communities in RoI than it is in non fluoridated areas in RoI and NI.

Table 3.1 Dean's Index of Fluorosis. Percentage of 8-, 12- and 15-year-old children and adolescents with a score of 'Normal', 'Questionable', 'Very Mild', 'Mild', 'Moderate' or 'Severe' fluorosis on their permanent dentition according to fluoridation status in RoI and NI

8-year-olds

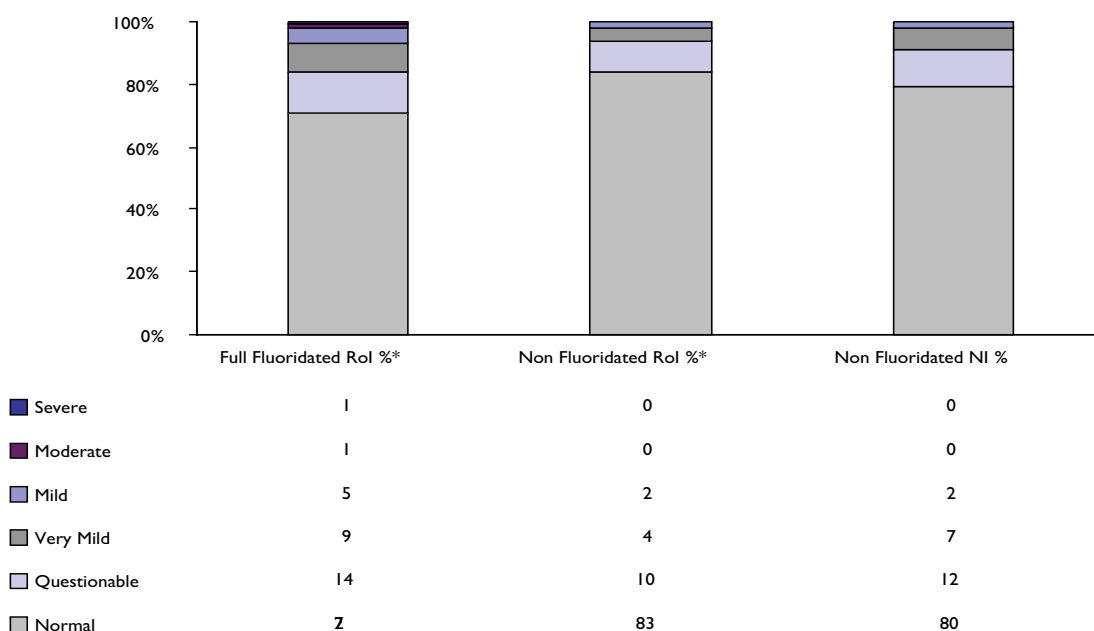
* ^ statistically significant difference between pairs of groups marked with same symbol



■ Severe	0	0	0
■ Moderate	0	0	0
■ Mild	4	0	0
■ Very Mild	8	3	3
■ Questionable	12	7	6
■ Normal	77	90	90

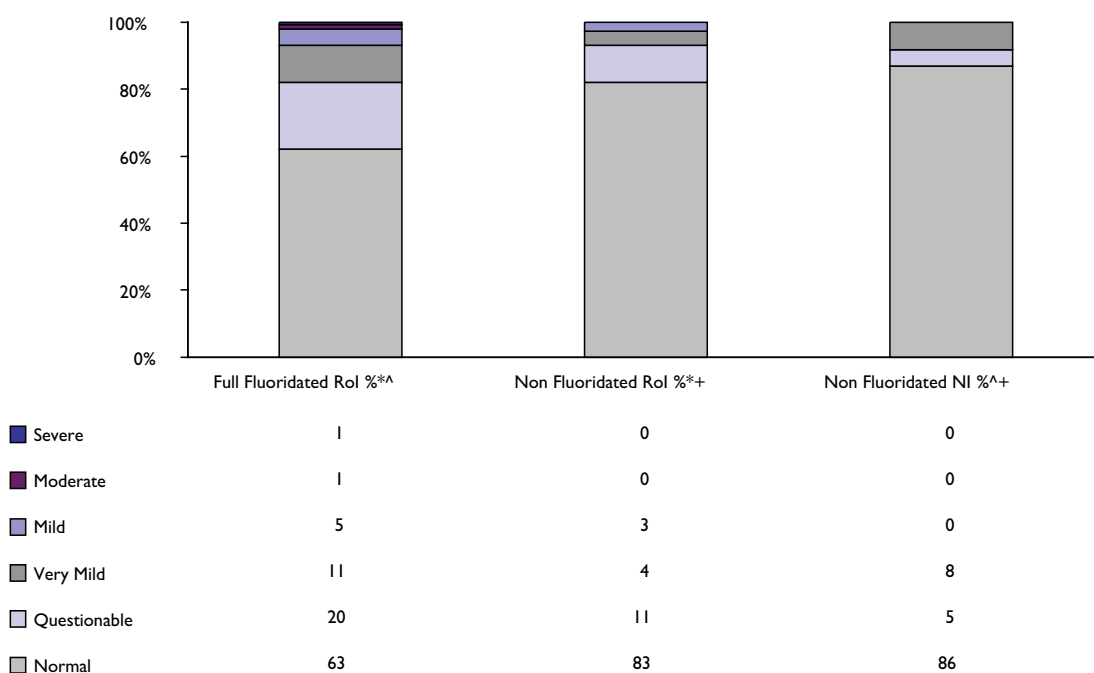
12-year-olds

* statistically significant difference between pairs of groups marked with same symbol



15-year-olds

* ^ + statistically significant difference between pairs of groups marked with same symbol



Between approximately one third and half of 8-year-old children examined in this survey had at least one opacity on their permanent teeth (Table 3.2). For all three age groups, the prevalence of children with 'any opacity' was highest amongst those who were lifetime residents of fluoridated communities. For example, amongst 12-year-olds, the percentage of children recorded as having 'any opacity' was 58.5% in the fluoridated communities in Rol, compared with 42.2% and 47.5% respectively in the non fluoridated communities of Rol and NI ($p < 0.05$).

As would be expected from the results obtained using Dean's Index (Table 3.1), the prevalence of 'diffuse' opacities (many of which are known to be associated with excessive fluoride ingestion during enamel formation) was highest in the fluoridated communities, except in the case of 8-year-olds where

the percentage affected by 'diffuse' opacities was the same amongst the fluoridated group in Rol and the non fluoridated group in NI. Amongst 12-year-olds, 48.6% of lifetime residents of fluoridated communities in Rol had one or more 'diffuse' opacities on their permanent teeth; considerably higher than the corresponding percentages in the non fluoridated groups in Rol at 28.9% ($p < 0.05$) and NI at 34.2% ($p < 0.05$).

Table 3.2 DDE Index. Percentage of 8-, 12- and 15-year-old children and adolescents with scores of 'Any Opacity', 'Demarcated', 'Diffuse', 'Hypoplastic', 'Demarcated and Diffuse', 'Demarcated and Hypoplastic', 'Diffuse and Hypoplastic', or 'All three' in fluoridated areas in Rol and non fluoridated areas in Rol and NI in 2002

	Age 8		
	Rol Full FI	Rol Non FI	NI Non FI
Any Opacity	52.3	35.2	51.4
Demarcated	15.3	15.4	17.1
Diffuse	41.0	21.8	41.0
Hypoplastic	1.3	2.4	4.8
Demarcated and Diffuse	4.0	1.2	3.8
Demarcated and Hypoplastic	0.4	0.1	1.0
Diffuse and Hypoplastic	0.9	0.5	2.4
All three	0.2	0.0	0.0
	Age 12		
	Rol Full FI	Rol Non FI	NI Non FI
Any Opacity	58.5	42.2	47.5
Demarcated	17.4	18.9	19.9
Diffuse	48.6	28.9	34.2
Hypoplastic	2.6	2.3	3.6
Demarcated and Diffuse	4.6	1.5	3.6
Demarcated and Hypoplastic	0.6	0.4	0.5
Diffuse and Hypoplastic	1.4	0.8	2.0
All three	0.3	0.2	0.0
	Age 15		
	Rol Full FI	Rol Non FI	NI Non FI
Any Opacity	62.1	49.7	51.7
Demarcated	18.4	19.4	22.0
Diffuse	52.0	37.4	40.2
Hypoplastic	2.3	1.7	6.2
Demarcated and Diffuse	5.0	2.5	5.6
Demarcated and Hypoplastic	0.3	1.1	0.5
Diffuse and Hypoplastic	3.0	1.7	1.9
All three	0.1	0.0	0.8

3.4 Fluorosis according to disadvantage

There is some evidence in the literature that the prevalence of fluorosis tends to be higher amongst the more affluent sections of the population. It has been postulated that the parents of children in this section of society are more likely to be able to purchase fluoride toothpaste and to begin brushing their children's teeth at a younger age. The findings of this survey are equivocal in relation to this hypothesis (Table 3.3). Amongst lifetime residents of fluoridated communities in Rol, the percentage of children categorised as having 'very mild' or higher fluorosis was higher in children whose parents were not in possession of a medical card for 12-year-olds (16.1% in comparison with 13.5%) and 15-year-olds (19.0% in comparison with 15.0%). However, for 8-year-olds, the percentage in these categories was lower amongst those whose parents did not possess a medical card (11.3%) when compared with those whose parents were in possession of a medical card (13.7%). Similarly, amongst the non fluoridated groups in Rol and NI, no consistent trend emerges in the association between disadvantage and the prevalence of fluorosis at the very mild or higher level.

Table 3.3 Dean's Index of Fluorosis. Percentage of 8-, 12- and 15-year-old children and adolescents with scores of 'Normal', 'Questionable', 'Very Mild', 'Mild', 'Moderate' or 'Severe' fluorosis by disadvantage in fluoridated areas in RoI and non fluoridated areas in RoI and NI in 2002

	Age 8					
	RoI Full FI		RoI Non FI		NI Non FI	
	MCYes	MC No	MCYes	MC No	LIBYes	LIB No
Normal	74.8	77.1	93.6	88.9	89.4	90.8
Questionable	11.6	11.7	3.3	7.7	5.9	6.7
Very Mild	7.8	7.7	3.0	2.6	4.7	1.7
Mild	5.4	3.2	0.1	0.3	0.0	0.8
Moderate	0.5	0.4	0.0	0.5		
Severe	0.0	0.0	0.0	0.0		
	Age 12					
	RoI Full FI		RoI Non FI		NI Non FI	
	MCYes	MC No	MCYes	MC No	LIBYes	LIB No
Normal	72.2	71.7	84.8	82.9	83.6	77.4
Questionable	14.6	13.6	12.6	9.4	5.5	15.7
Very Mild	7.7	9.1	2.6	4.6	6.9	7.0
Mild	3.7	5.0	0.2	2.8	4.1	0.0
Moderate	2.1	0.7	0.0	0.4		
Severe	0.0	1.3	0.0	0.0		
	Age 15					
	RoI Full FI		RoI Non FI		NI Non FI	
	MCYes	MC No	MCYes	MC No	LIBYes	LIB No
Normal	64.1	63.2	79.9	82.7	94.4	81.5
Questionable	21.1	18.8	14.4	11.0	1.6	7.3
Very Mild	10.2	10.8	5.5	2.6	4.0	10.9
Mild	3.7	6.0	0.3	3.4	0.0	0.4
Moderate	1.1	1.4	0.0	0.4		
Severe	0.0	0.8	0.0	0.0		

Using the DDE Index, again, there is no association between the prevalence of children with one or more teeth affected by 'any opacity' and disadvantage. Also, no clear trends are obvious between the prevalence of 'demarcated', 'diffuse', 'hypoplastic' opacities, or combinations of these, and disadvantage (Table 3.4).

Table 3.4 DDE Index. Percentage of 8-, 12- and 15-year-old children and adolescents with scores of 'Any Opacity', 'Demarcated', 'Diffuse', 'Hypoplastic', 'Demarcated and Diffuse', 'Demarcated and Hypoplastic', 'Diffuse and Hypoplastic', or 'All three' by disadvantage in fluoridated areas in RoI and non fluoridated areas in RoI and NI in 2002

	Age 8					
	RoI Full FI		RoI Non FI		NI Non FI	
	MCYes	MC No	MCYes	MC No	LIBYes	LIB No
Any Opacity	54.5	51.8	36.4	34.6	52.9	51.3
Demarcated	16.0	15.3	16.3	14.7	16.1	18.5
Diffuse	41.1	41.3	23.0	21.6	42.5	40.3
Hypoplastic	2.6	1.1	2.5	2.0	8.1	2.5
Demarcated and Diffuse	5.1	3.9	0.5	1.3	5.8	2.5
Demarcated and Hypoplastic	0.6	0.3	0.2	0.0	2.3	0.0
Diffuse and Hypoplastic	1.7	0.6	0.2	0.5	3.5	1.7
All three	0.6	0.1	0.0	0.0	0.0	0.0

	Age 12					
	RoI Full FI		RoI Non FI		NI Non FI	
	MC Yes	MC No	MC Yes	MC No	LIB Yes	LIB No
Any Opacity	55.6	58.7	38.7	43.3	48.0	47.0
Demarcated	15.0	17.8	17.7	19.2	20.6	20.0
Diffuse	47.1	48.7	25.9	29.7	34.3	33.9
Hypoplastic	1.7	2.7	0.7	3.0	4.1	3.5
Demarcated and Diffuse	4.1	4.6	2.0	1.2	4.1	2.6
Demarcated and Hypoplastic	0.3	0.6	0.0	0.5	0.0	0.9
Diffuse and Hypoplastic	1.3	1.3	0.3	1.1	2.7	0.9
All three	0.3	0.3	0.0	0.3	0.0	0.0
	Age 15					
	RoI Full FI		RoI Non FI		NI Non FI	
	MC Yes	MC No	MC Yes	MC No	LIB Yes	LIB No
Any Opacity	63.3	61.6	43.0	51.6	50.4	51.7
Demarcated	18.3	19.1	20.5	18.3	20.8	22.3
Diffuse	52.0	51.9	34.5	38.0	37.6	40.5
Hypoplastic	3.0	1.7	0.8	2.5	8.0	5.4
Demarcated and Diffuse	5.0	5.0	0.2	3.5	2.4	7.0
Demarcated and Hypoplastic	0.3	0.3	1.3	1.5	0.0	0.8
Diffuse and Hypoplastic	3.0	3.0	0.4	2.1	3.2	1.2
All three	0.0	0.2	0.0	0.0	0.0	1.2

3.5 Changes in the prevalence of fluorosis over time

In the National Survey of Children's Dental Health in 1984, fluorosis was measured for 8- and 15-year-olds. At that time, among 8-year-olds in fluoridated regions, 94.0% had normal enamel, 5.0% had 'questionable' fluorosis, and 1.0% had fluorosis at the Dean's 'very mild' level. The corresponding figures for 15-year-olds were 94.7%, 4.0% and 0.9% respectively; 0.4% had 'mild' fluorosis. The prevalence of fluorosis among 8- and 15-year-olds in RoI has increased since 1984 (Table 3.5) ($p < 0.0001$ for both age groups). There was also an increase in the prevalence of children with fluorosis in the non fluoridated communities. In response to these changes, and to the widespread use of fluoride toothpaste, the Forum on Fluoridation⁶ recommended a reduction in the level of fluoride in public water supplies from the present level (between 0.8 and 1.0 ppm) to between 0.6 and 0.8 ppm, with a target value of 0.7 ppm. The contribution of fluoride toothpastes to enamel fluorosis in Ireland should be studied further. Recent research suggests a significant relationship between patterns of toothpaste usage in infancy and prevalence of fluorosis at age 8 years amongst children in counties Sligo and Leitrim^{7,8}. These findings support those of international research^{9,10}, which indicate that early use of fluoride toothpaste in infants leads to excessive ingestion and absorption of fluoride at a time when the enamel of the permanent teeth is forming (between age 1 to 5 years), leading to fluorosis of the permanent incisor teeth. Thus, it is important to disseminate the recommendations of the Forum on Water Fluoridation⁶ regarding the rational use of fluoride toothpaste. The report recommended:

- The continued use of fluoride toothpaste in fluoridated and non-fluoridated areas because of the additive benefit from the combination of fluoridated water and fluoride toothpaste.
- Parents should be advised not to use toothpaste when brushing their children's teeth until the age of 2 years. Prior to this age, parents can brush their children's teeth with a toothbrush and tap water. Professional advice on the use of fluoride toothpaste should be sought where a child below 2 years of age is considered to be at high risk of developing dental decay.
- Parents should supervise children aged 2 to 7 years when brushing their teeth and should ensure that only a small, pea-sized amount of fluoride toothpaste is used and that swallowing of the paste is avoided.

The change in the level of fluoride in the water and adherence to these guidelines is expected to minimize the occurrence of dental fluorosis and, at the same time, maintain the important caries preventive benefits experienced to date.

Dental fluorosis will continue to be monitored in Ireland as water fluoride levels are reduced and as information about the recommended use of fluoride toothpaste is disseminated.

Table 3.5 Dean's Index of Fluorosis. Percentage of 8- and 15-year-old children and adolescents with a score of 'Normal', 'Questionable', 'Very Mild', 'Mild', 'Moderate' or 'Severe' fluorosis on their permanent dentition, in Rol in 1984 and in 2002, by fluoridation status

	Age 8			
	1984		2002	
	Full FI	Non FI	Full FI	Non FI
Normal	94.0	98.1	76.7	90.2
Questionable	5.0	1.9	11.6	6.6
Very Mild	1.0	0.0	7.8	2.6
Mild	0.0	0.0	3.6	0.3
Moderate			0.4	0.4
Severe			0.0	0.0
	Age 15			
	1984		2002	
	Full FI	Non FI	Full FI	Non FI
Normal	94.7	99.4	63.1	83.0
Questionable	4.0	0.6	19.7	10.5
Very Mild	0.9	0.0	10.6	3.6
Mild	0.4	0.0	5.4	2.6
Moderate			1.4	0.3
Severe			0.6	0.0

3.6 The prevalence of enamel fluorosis according to the age at which tooth brushing started

A number of studies have reported that the age at which children begin to have their teeth brushed is associated with the prevalence of fluorosis in the permanent dentition¹¹. In this survey, the parents of 8-year-old children were asked: "At what age did you or your child start brushing your child's teeth?" It must be acknowledged that this question relies on the respondents' ability to recall an event that occurred at least six years earlier. The results are presented for residents of fluoridated and non fluoridated communities in Rol (Table 3.6). A total of 21 subjects in fluoridated communities in Rol claimed their child's teeth were not brushed. Of the 558 parents who claimed to have started brushing when the child was less than 12 months, the percentage of these children with 'very mild', 'mild', 'moderate' or 'severe' fluorosis were 9.5%, 3.7%, 0.7% and 0.0% respectively. Similar distributions are seen for those parents who claimed they started brushing between 12 and 18 months (n = 820), between 19 and 24 months (n = 375) and over 24 months (n = 360). In the non fluoridated group in Rol, 'mild' and 'moderate' fluorosis were found only in children who started brushing at 18 months or earlier. In NI, a higher percentage of children who started brushing before 18 months had fluorosis at 'questionable' or higher level than those who started later.

Table 3.6 Dean's Index of Fluorosis. Percentage of 8-year-old children in fluoridated and non fluoridated areas in Rol and non fluoridated NI with a score of 'Normal', 'Questionable', 'Very Mild', 'Mild', 'Moderate' or 'Severe' fluorosis on their permanent dentition according to age at which tooth brushing started

	Rol Full FI				
	not brushed (n = 21)	< 12 months (n = 558)	12-18 months (n = 820)	19 - 24 months (n = 375)	>24 months (n = 360)
Normal	65.4	74.9	77.1	76.8	76.8
Questionable	23.1	11.5	11.3	12.4	12.1
Very Mild	5.8	9.5	8.1	6.1	6.7
Mild	5.8	3.7	3.1	4.5	3.6
Moderate	0.0	0.7	0.7	0.7	1.8
Severe	0.0	0.0	0.0	0.0	0.0

	RoI Non FI				
	not brushed (n = 11)	< 12 months (n = 193)	12-18 months (n = 325)	19 - 24 months (n = 114)	>24 months (n = 138)
Normal	100.0	86.5	92.8	85.9	92.4
Questionable	0.0	8.3	3.7	11.0	6.6
Very Mild	0.0	4.7	2.0	3.1	1.0
Mild	0.0	0.0	0.8	0.0	0.0
Moderate	0.0	1.1	1.3	0.0	0.0
Severe	0.0	0.0	0.0	0.0	0.0
	NI Non FI				
	not brushed (n = 1)	< 12 months (n = 105)	12-18 months (n = 67)	19 - 24 months (n = 16)	>24 months (n = 16)
Normal	100.0	90.5	89.6	93.8	93.8
Questionable	0.0	6.6	7.5	0.0	6.3
Very Mild	0.0	1.9	3.0	6.3	0.0
Mild	0.0	1.0	0.0	0.0	0.0
Moderate	0.0	0.0	0.0	0.0	0.0
Severe	0.0	0.0	0.0	0.0	0.0

Using the DDE Index (Table 3.7), again, as in the case of Dean's Index, the age at which tooth brushing started is not associated with the prevalence of the various categories of opacities recorded in 8-year-old lifetime residents of fluoridated communities in RoI. For example, the percentage with 'diffuse' opacities amongst those claiming to have started tooth brushing at the four different age periods were 41.3%, 40.4%, 42.8% and 41.2% respectively. The corresponding percentages for 'diffuse' opacities in the non fluoridated group were 22.6%, 21.5%, 24.3% and 18.7% respectively; again indicating that there was no association between the age at which tooth brushing commenced and the prevalence of 'diffuse' opacities. The picture is different in NI: 48.1% of those whose parents reported that they started brushing before age 12 months had 'diffuse' opacities compared to 31.3% of those who started brushing between 12 and 18 months. The numbers in the other two categories were too small to give reliable results. Thus, in NI an association between age at which tooth brushing began and dental fluorosis was more evident. Interestingly, in NI 51.2% of parents reported commencing brushing their child's teeth before 12 months, compared with 26.3% in the fluoridated RoI sample and 24.7% in the non fluoridated RoI sample.

Table 3.7 DDE Index. Percentage of 8-year-old children in fluoridated and non fluoridated areas in RoI and non fluoridated NI with scores of 'Any Opacity', 'Demarcated', 'Diffuse', 'Hypoplastic', 'Demarcated and Diffuse', 'Demarcated and Hypoplastic', 'Diffuse and Hypoplastic', or 'All three' on their permanent dentition according to age at which tooth brushing started

	RoI Full FI				
	not brushed (n = 22)	< 12 months (n = 565)	12-18 months (n = 826)	19 - 24 months (n = 375)	>24 months (n = 360)
Any Opacity	42.5	52.7	51.7	51.7	53.0
Demarcated	8.2	16.1	15.0	13.1	16.4
Diffuse	35.9	41.3	40.4	42.8	41.2
Hypoplastic	0.0	0.8	1.6	0.5	2.4
Demarcated and Diffuse	0.0	3.1	4.0	5.5	5.1
Demarcated and Hypoplastic	0.0	0.0	1.2	0.8	0.0
Diffuse and Hypoplastic	0.0	1.2	1.3	0.5	1.1
All three	0.0	0.5	0.4	0.0	1.3

	RoI Non FI				
	not brushed (n = 11)	< 12 months (n = 193)	12-18 months (n = 324)	19 - 24 months (n = 114)	>24 months (n = 138)
Any Opacity	17.1	35.4	34.0	41.2	28.1
Demarcated	8.0	12.3	15.2	22.2	11.5
Diffuse	1.1	22.6	21.5	24.3	18.7
Hypoplastic	8.0	1.9	2.2	2.4	1.1
Demarcated and Diffuse	4.2	2.1	0.5	0.8	1.1
Demarcated and Hypoplastic	0.0	0.0	0.3	0.0	0.0
Diffuse and Hypoplastic	0.0	0.5	0.5	0.0	0.1
All three	0.0	0.0	0.0	0.0	0.0
	NI Non FI				
	not brushed (n = 1)	< 12 months (n = 106)	12-18 months (n = 67)	19 - 24 months (n = 16)	>24 months (n = 17)
Any Opacity	100.0	59.4	43.3	31.3	52.9
Demarcated	100.0	17.9	20.9	0.0	11.8
Diffuse	0.0	48.1	31.3	31.3	47.1
Hypoplastic	0.0	5.7	4.5	6.3	0.0
Demarcated and Diffuse	0.0	3.8	4.5	6.3	0.0
Demarcated and Hypoplastic	0.0	0.0	1.5	0.0	5.9
Diffuse and Hypoplastic	0.0	4.7	0.0	0.0	0.0
All three	0.0	0.0	0.0	0.0	0.0

The results for RoI and NI differ in the tendency to show an association between age of commencement of toothbrushing and fluorosis. These results need to be interpreted with caution, as the method of measurement of the age at which brushing began relies on the parents' memory of an event that took place at least six years earlier. The validity of such long-term recall is unknown. Further research is required to investigate the relationship between tooth brushing habits in infancy and the prevalence of enamel fluorosis in the Irish context.

3.7 The prevalence of fluorosis according to whether parents/subjects noticed marks on their front teeth in the Republic of Ireland and Northern Ireland

Parents of 8-year-old lifetime residents of fluoridated and non fluoridated communities in RoI and non fluoridated NI were asked: "Have you noticed any brown, creamy or white marks on your child's front teeth which don't brush off?" (Table 3.8). 15-year-olds were asked the same question in respect of their own front teeth. For both 8- and 15-year-olds in fluoridated and non-fluoridated areas, a number of the respondents answered 'Don't Know' to the question; this was especially true of 15-year-olds. Looking at the results for those who answered 'Yes' or 'No' to the question, it is seen that in all groups the percentage answering 'Yes' to the question tended to increase as the level of fluorosis increased. For example, amongst 8-year-olds living in fluoridated areas, 26.0% of the parents of the 1,617 8-year-olds deemed to have normal enamel noticed marks, whereas 55.9% of parents of the 71 8-year-olds with 'mild' fluorosis noticed marks.

A similar pattern emerges amongst 15-year-old residents of fluoridated communities, where 32.4% of the 1,270 adolescents with normal enamel claimed to have noticed marks on their front teeth compared with 59.4% of the 96 15-year-olds with 'mild' fluorosis.

In the case of 8- and 15-year-old residents of non fluoridated communities in RoI and NI, the percentages noticing marks also tended to increase with increasing levels of enamel fluorosis.

Table 3.8 Dean's Index of Fluorosis. Percentage of 8- and 15-year-olds in fluoridated and non fluoridated areas in RoI and non fluoridated NI, with a score of 'Normal', 'Questionable', 'Very Mild', 'Mild', 'Moderate' or 'Severe' fluorosis on their permanent dentition according to whether parents/subjects noticed marks on their front teeth

	RoI Full FI							
	Age 8				Age 15			
	n	Yes (n = 646)	No (n = 1410)	Don't Know (n = 55)	n	Yes (n = 746)	No (n = 857)	Don't Know (n = 355)
Normal	1617	26.0	71.1	3.0	1270	32.4	47.7	19.9
Questionable	257	43.1	56.0	1.0	368	41.1	39.9	19.0
Very Mild	158	52.4	47.1	0.5	201	45.8	40.7	13.5
Mild	71	55.9	41.6	2.6	96	59.4	31.8	8.8
Moderate	8	77.9	22.1	0.0	22	70.3	13.7	16.0
Severe					1	100.0	0.0	0.0
	RoI Non FI							
	Age 8				Age 15			
	n	Yes (n = 194)	No (n = 565)	Don't Know (n = 16)	n	Yes (n = 196)	No (n = 277)	Don't Know (n = 122)
Normal	677	20.3	77.0	2.7	455	35.0	43.5	21.5
Questionable	70	50.1	49.9	0.0	82	43.5	26.0	30.6
Very Mild	22	66.8	32.6	0.5	44	49.0	43.6	7.4
Mild	4	82.1	17.9	0.0	12	36.0	64.0	0.0
Moderate	2	100.0	0.0	0.0	2	100.0	0.0	0.0
Severe								
	NI Non FI							
	Age 8				Age 15			
	n	Yes (n = 51)	No (n = 145)	Don't Know (n = 4)	n	Yes (n = 106)	No (n = 195)	Don't Know (n = 74)
Normal	182	23.6	74.2	2.2	322	26.1	54.4	19.6
Questionable	13	23.1	76.9	0.0	20	40.0	30.0	30.0
Very Mild	4	100.0	0.0	0.0	32	40.6	43.8	15.6
Mild	1	100.0	0.0	0.0	1	100.0	0.0	0.0
Moderate								
Severe								

The percentage of parents of 8-year-olds, and 15-year-olds themselves, who answered 'Yes' to the question about noticing marks on their front teeth was very similar for those with 'demarcated' or 'diffuse' opacities in both age groups in fluoridated and non fluoridated communities (Table 3.9). For example, of the 892 8-year-old children with 'diffuse' opacities living in fluoridated communities, 37.9% of the parents claimed that they noticed marks on the front teeth of their child, which is very similar to the 42.0% of the parents of the 315 8-year-olds with 'demarcated' opacities. The percentages answering 'Yes' to the question tended to be higher amongst those with a combination of 'demarcated' and 'diffuse' opacities, even though the numbers with this score tended to be low.

Table 3.9 DDE Index. Percentage of 8- and 15-year-olds in fluoridated and non fluoridated areas in RoI and non fluoridated NI, with scores of 'Any Opacity', 'Demarcated', 'Diffuse', 'Hypoplastic', 'Demarcated and Diffuse', 'Demarcated and Hypoplastic', 'Diffuse and Hypoplastic', or 'All three' on their permanent dentition according to whether parents/subjects noticed marks on their front teeth

	RoI Full FI							
	Age 8				Age 15			
	n	Yes (n = 648)	No (n = 1422)	Don't know (n = 55)	n	Yes (n = 745)	No (n = 854)	Don't know (n = 354)
Any Opacity	1111	38.9	59.4	1.7	1290	41.4	39.8	18.8
Demarcated	315	42.0	56.2	1.8	372	46.8	38.4	14.8
Diffuse	892	37.9	60.2	1.9	1094	41.7	39.9	18.4
Hypoplastic	25	30.7	67.0	2.4	44	38.0	49.7	12.3
Demarcated and Diffuse	89	45.1	54.9	0.0	109	64.7	24.7	10.6
Demarcated and Hypoplastic	6	22.6	77.4	0.0	4	32.0	0.0	68.0
Diffuse and Hypoplastic	19	58.7	41.3	0.0	56	52.3	31.8	15.9
All three	3	33.2	66.8	0.0	2	66.3	33.7	0.0
	RoI Non FI							
	Age 8				Age 15			
	n	Yes (n = 193)	No (n = 566)	Don't Know (n = 16)	n	Yes (n = 197)	No (n = 278)	Don't Know (n = 122)
Any Opacity	307	40.1	58.2	1.8	300	44.5	36.8	18.8
Demarcated	125	46.8	53.2	0.0	115	50.0	24.0	26.0
Diffuse	202	44.7	53.0	2.2	224	48.4	34.1	17.6
Hypoplastic	23	49.3	50.7	0.0	22	81.7	10.4	8.0
Demarcated and Diffuse	14	44.5	55.5	0.0	9	56.0	38.0	6.1
Demarcated and Hypoplastic	2	87.3	0.0	12.7	6	91.6	5.6	2.8
Diffuse and Hypoplastic	5	86.2	13.8	0.0	7	41.9	52.1	6.0
All three	0							
	NI Non FI							
	Age 8				Age 15			
	n	Yes (n = 52)	No (n = 146)	Don't Know (n = 4)	n	Yes (n = 104)	No (n = 194)	Don't Know (n = 70)
Any Opacity	103	34.0	65.1	1.0	189	29.6	52.4	18.0
Demarcated	34	32.4	64.7	2.9	78	24.4	53.9	21.8
Diffuse	82	36.6	63.4	0.0	147	30.6	53.1	16.3
Hypoplastic	9	44.4	55.6	0.0	23	30.4	47.8	21.7
Demarcated and Diffuse	8	62.5	37.5	0.0	20	30.0	50.0	20.0
Demarcated and Hypoplastic	2	50.0	50.0	0.0	2	50.0	50.0	0.0
Diffuse and Hypoplastic	5	20.0	80.0	0.0	7	42.9	57.1	0.0
All three	0				2	50.0	50.0	0.0

3.8 Multivariate Analysis

Demographic and questionnaire variables were analysed in SAS (version 9.1) using Logistic Regression to determine their effect on the presence or absence of fluorosis (Dean's Index of Fluorosis) among 8-year-old children in Rol.

The variables and their levels tested for inclusion in the model were as follows:

- Fluoridation status – Non Fluoridated, Full Fluoridated.
- Parent's Occupation Class – Highest occupation class level of parents.
- Gender – Male, Female.
- Age began brushing - Before 12 months of age, After 12 months of age.
- Frequency of brushing – Once a day or less, Two times a day or more.
- Amount of toothpaste used when brushing – Pea sized amount of toothpaste, Half a brush head of toothpaste or more.
- Method of rinsing after brushing – Child does not rinse, Other method.
- Duration of bottle-feeding using infant formula – Less than 18 months, 18 months or more.

The variables that were significant for the presence or absence of fluorosis were Fluoridation Status ($p < 0.0001$) and Gender ($p = 0.0201$). The prevalence of fluorosis was higher in those who resided in fully fluoridated areas (23.3%) than those who resided in non fluoridated areas (13.0%). It was also higher for females (22.2%) than males (18.8%). Interaction terms between variables were also tested for inclusion in the model but were not significant.

For further analyses, the levels of Dean's Index of Fluorosis were dichotomised as follows: those with 'normal' or 'questionable' levels comprised one group; those with 'very mild', 'mild', 'moderate' or 'severe' levels comprised the second group. All of the demographic and questionnaire variables were analysed using Logistic Regression to determine their effect on fluorosis at the 'normal' or 'questionable' levels in Dean's Index against the 'very mild' or higher levels. For this analysis, the only variable that was significant was Fluoridation Status ($p < 0.0001$). The prevalence of fluorosis at the 'very mild' or higher levels was greater among those who resided in fully fluoridated areas (11.3%) compared to those who resided in non fluoridated areas (3.7%). Again, interaction terms between variables were also tested for inclusion in the model but were not significant.

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Chapter 4

Need for Oral Hygiene Instruction or Periodontal Care in RoI

4.1 Summary

- For 8-, 12- and 15-year-olds, the percentages deemed to require oral hygiene instruction including professional removal of plaque and calculus were 11.3%, 17.2% and 21.4%, respectively. The majority of the remainder required oral hygiene instruction only. Between approximately a quarter and a third were deemed to require no treatment.
- For 5-year-olds, the need for oral hygiene instruction including professional removal of plaque and calculus was very rare (0.9%). Oral hygiene instruction only was required by approximately one third.
- The need for urgent referral for professional advice was relatively rare in all age groups.
- The need for oral hygiene instruction or periodontal care varied widely between health boards.
- There was a slight trend for less treatment to be required by those who brushed their teeth more frequently, those who visited the dentist regularly, and those who consumed sweet foods and drinks between meals less frequently.

4.2 Introduction

The clinical examination of the children and adolescents in the Republic of Ireland (RoI) included an assessment of the oral hygiene status and also included a decision on the need for instruction in oral hygiene only, or the need for oral hygiene instruction together with professional plaque and calculus removal. This examination was not carried out in Northern Ireland (NI). The following codes were used:

Code 0	No need for treatment; the subject had excellent oral hygiene.
Code 1	Oral hygiene instruction only required; visual plaque may be present, but visual calculus is not present.
Code 2	Oral hygiene instruction required including professional removal of plaque and calculus; visual calculus had to be present, otherwise the subject was given a Code 1 if visual plaque was present without visual calculus.

In addition to the above examination, a separate assessment was undertaken to determine the need for urgent referral for professional advice or treatment. Referral was deemed necessary when, because of the condition of the periodontal tissues, irreversible damage was likely. The examiners were advised to use this code (r) especially for cases where, for example, there was urgent need for removal of gross calculus/acute gingivitis where the gingiva appeared shiny, were engorged and tended to bleed spontaneously. Acute Necrotising Ulcerative Gingivitis (ANUG) and other acute conditions of the gingival and periodontal tissues, which needed urgent immediate treatment, were also considered to need urgent referral.

All periodontal tissues were visually assessed. A periodontal probe was not used. Children and adolescents aged 5-, 8-, 12- and 15-years in RoI were assessed.

4.3 The need for oral hygiene instruction, plaque and calculus removal and urgent referral

Of the 4,652 5-year-olds examined in RoI, 63.1% were deemed to require 'no need for treatment', 36.1% required 'oral hygiene instruction' (OHI), and 0.9% were deemed to need 'oral hygiene instruction and plaque + calculus removal' (Table 4.1). The need for 'urgent referral' was deemed to be rarely required in this age group (0.5%). For 8-, 12- and 15-year-olds, between a quarter and a third of those examined were deemed to have 'no need for treatment'. For 8-year-olds, the majority of the remainder were judged to require 'oral hygiene instruction' (61.0%), with 11.3% requiring 'oral hygiene instruction and plaque + calculus removal'. For 12- and 15-year-olds, the percentages requiring 'oral hygiene instruction' only were 54.1% and 45.1% respectively; the need for 'oral hygiene instruction and plaque + calculus removal' was somewhat higher in these age groups than in the 8-year-old age group, at 17.2% and 21.4% respectively. The need for 'urgent referral' was again relatively rare in 8-, 12- and 15-year-olds at 1.8%, 2.9% and 2.5% respectively.

Table 4.1 The numbers and percentages of 5-, 8-, 12- and 15-year-old children and adolescents with codes 'no need for treatment', 'OHI required', 'OHI and plaque + calculus removal', and 'need for urgent referral' in Rol in 2002

	Age Group			
	5 (n = 4652)	8 (n = 3763)	12 (n = 3865)	15 (n = 3514)
no need for treatment	63.1	27.6	28.7	33.5
OHI required	36.1	61.0	54.1	45.1
OHI and plaque + calculus removal	0.9	11.3	17.2	21.4
need for urgent referral	0.5	1.8	2.9	2.5

4.3.1 The need for oral hygiene instruction, plaque and calculus removal and urgent referral by health board

There is a very large variation between health boards in the need for 'oral hygiene instruction and plaque + calculus removal' (Table 4.2). For example, amongst 12-year-olds, the percentage deemed to have 'no need for treatment' varied from 10.2% in the Mid-Western Health Board (MWHB) to 56.9% in the Midland Health Board (MHB). Similar large variations were seen for the categories 'oral hygiene instruction required' and 'oral hygiene instruction and plaque + calculus removal'. The variation between health boards in the need for 'oral hygiene instruction and plaque + calculus removal', seen in Table 4.2, is likely to be due to many reasons. However, it is worth noting that training and calibration of examiners to record oral hygiene and periodontal status is generally regarded as problematical, and examiner variability is likely to account for some of the differences seen. However, despite the wide variation found between health boards in the levels of plaque and calculus, the figures for all health boards combined probably give a valid estimate of the need for 'oral hygiene instruction and plaque + calculus removal'. The fact that this estimate lacks precision is probably a reflection of the somewhat subjective nature of the criteria used in these assessments. The need for care, as estimated by the 32 clinicians who carried out the assessments, is probably a reasonable reflection of the situation in real life amongst the practicing profession.

For all age groups in all health boards, the need for 'urgent referral' is deemed to be relatively rare (Table 4.2).

Table 4.2 The numbers and percentages of 5-, 8- 12- and 15-year-old children and adolescents with codes 'no need for treatment', 'OHI required', 'OHI and plaque + calculus removal', and 'need for urgent referral' by health board in 2002

ERHA	Age Group			
	5 (n = 716)	8 (n = 933)	12 (n = 855)	15 (n = 893)
no need for treatment	67.9	20.6	22.9	27.3
OHI required	31.3	68.0	56.9	45.3
OHI and plaque + calculus removal	0.8	11.4	20.3	27.4
need for urgent referral	0.0	0.5	0.8	0.8
ERHA-ECAHB	Age Group			
	5 (n = 227)	8 (n = 248)	12 (n = 217)	15 (n = 230)
no need for treatment	76.9	39.4	34.3	37.8
OHI required	22.8	50.6	46.7	37.4
OHI and plaque + calculus removal	0.3	10.0	19.0	24.9
need for urgent referral	0.0	0.3	0.0	0.5
ERHA-NAHB	Age Group			
	5 (n = 272)	8 (n = 356)	12 (n = 325)	15 (n = 334)
no need for treatment	69.4	25.4	22.5	33.6
OHI required	30.2	63.4	53.1	41.0

OHI and plaque + calculus removal	0.4	11.2	24.4	25.4
need for urgent referral	0.0	0.2	0.0	1.1
	Age Group			
ERHA-SWAHB	5 (n = 217)	8 (n = 329)	12 (n = 313)	15 (n = 329)
no need for treatment	62.5	7.0	17.6	16.6
OHI required	36.2	80.8	65.1	53.0
OHI and plaque + calculus removal	1.3	12.2	17.3	30.4
need for urgent referral	0.0	0.8	1.8	0.7
	Age Group			
MHB	5 (n = 306)	8 (n = 274)	12 (n = 337)	15 (n = 258)
no need for treatment	92.1	73.0	56.9	59.7
OHI required	7.9	21.1	25.6	24.8
OHI and plaque + calculus removal	0.0	5.8	17.5	15.5
need for urgent referral	0.4	6.0	9.3	7.6
	Age Group			
MWHB	5 (n = 361)	8 (n = 402)	12 (n = 413)	15 (n = 350)
no need for treatment	44.3	18.0	10.2	16.4
OHI required	55.2	74.1	74.3	56.6
OHI and plaque + calculus removal	0.5	7.9	15.5	27.0
need for urgent referral	1.0	0.8	0.7	1.3
	Age Group			
NEHB	5 (n = 1570)	8 (n = 367)	12 (n = 345)	15 (n = 329)
no need for treatment	78.6	25.2	27.5	36.7
OHI required	20.1	39.2	40.2	40.2
OHI and plaque + calculus removal	1.3	35.7	32.3	23.1
need for urgent referral	0.5	6.4	10.3	6.5
	Age Group			
NWHB	5 (n = 270)	8 (n = 242)	12 (n = 268)	15 (n = 263)
no need for treatment	66.9	31.4	35.7	33.7
OHI required	33.1	51.4	40.4	36.4
OHI and plaque + calculus removal	0.0	17.2	23.9	29.9
need for urgent referral	0.0	1.6	2.3	2.5
	Age Group			
SEHB	5 (n = 534)	8 (n = 547)	12 (n = 592)	15 (n = 495)
no need for treatment	48.5	20.9	23.2	26.0
OHI required	48.7	66.6	56.4	45.9
OHI and plaque + calculus removal	2.8	12.5	20.4	28.1
need for urgent referral	1.0	1.8	1.7	2.2

SHB	Age Group			
	5 (n = 517)	8 (n = 650)	12 (n = 698)	15 (n = 621)
no need for treatment	49.1	29.0	32.9	36.0
OHI required	50.3	66.4	61.4	52.0
OHI and plaque + calculus removal	0.6	4.6	5.7	12.0
need for urgent referral	1.3	0.4	1.3	2.6

WHB	Age Group			
	5 (n = 378)	8 (n = 348)	12 (n = 357)	15 (n = 305)
no need for treatment	64.7	37.2	42.5	53.7
OHI required	35.3	61.9	53.8	45.6
OHI and plaque + calculus removal	0.0	0.8	3.8	0.7
need for urgent referral	0.2	2.3	5.0	2.4

4.3.2 The need for oral hygiene instruction, plaque and calculus removal and urgent referral by gender

The percentages of males and females deemed to require 'oral hygiene instruction', 'oral hygiene instruction and plaque + calculus removal' or 'urgent referral' were similar across all age groups, with females requiring slightly less oral hygiene instruction (Table 4.3).

Table 4.3 The numbers and percentages of 5-, 8-, 12- and 15-year-old children and adolescents with codes 'no need for treatment', 'OHI required', 'OHI and plaque + calculus removal', and 'need for urgent referral' by gender in Rol in 2002

	Age 5	
	Male (n = 2396)	Female (n = 2256)
no need for treatment	59.4	63.2
OHI required	39.5	36.1
OHI and plaque + calculus removal	1.1	0.7
need for urgent referral	0.4	0.7

	Age 8	
	Male (n = 1887)	Female (n = 1876)
no need for treatment	25.6	29.8
OHI required	61.8	60.3
OHI and plaque + calculus removal	12.7	9.8
need for urgent referral	1.9	1.6

	Age 12	
	Male (n = 1880)	Female (n = 1985)
no need for treatment	22.9	34.7
OHI required	56.7	51.2
OHI and plaque + calculus removal	20.4	14.1
need for urgent referral	3.5	2.4

	Age 15	
	Male (n = 1772)	Female (n = 1742)
no need for treatment	27.8	39.4
OHI required	49.3	40.6
OHI and plaque + calculus removal	22.9	20.0
need for urgent referral	3.0	2.2

4.3.3 The need for oral hygiene instruction, plaque and calculus removal and urgent referral by disadvantage

In all four age groups, the percentage of subjects deemed to have 'no need for treatment', was higher amongst those whose parents did not possess a medical card (Table 4.4). For example, 30.8% of 12-year-old dependents of non medical card holders (non disadvantaged) had 'no need for treatment', in comparison with 21.2% of 12-year-old dependents of medical card holders (disadvantaged). The percentages requiring 'oral hygiene instruction' or 'oral hygiene instruction and plaque + calculus removal' were, as a result, higher amongst those whose parents were in possession of a medical card. The need for 'urgent referral' tended to be slightly higher amongst the disadvantaged group (those whose parents were in possession of medical cards), but the differences were not statistically significant.

Table 4.4 The numbers and percentages of 5-, 8-, 12- and 15-year-old children and adolescents with codes 'no need for treatment', 'OHI required', 'OHI and plaque + calculus removal', and 'need for urgent referral' by disadvantage in Rol in 2002

	Age 5	
	MC Yes (n = 1123)	MC No (n = 3498)
no need for treatment	51.8	65.0
OHI required	47.3	34.0
OHI + plaque + calculus removal	0.9	0.9
need for urgent referral	0.4	0.5
	Age 8	
	MC Yes (n = 873)	MC No (n = 2854)
no need for treatment	23.8	28.7
OHI required	65.4	60.0
OHI and plaque + calculus removal	10.8	11.3
need for urgent referral	2.7	1.5
	Age 12	
	MC Yes (n = 894)	MC No (n = 2956)
no need for treatment	21.2	30.8
OHI required	59.1	52.7
OHI and plaque + calculus removal	19.7	16.5
need for urgent referral	3.7	2.6
	Age 15	
	MC Yes (n = 949)	MC No (n = 2543)
no need for treatment	28.2	35.5
OHI required	47.4	44.0
OHI and plaque + calculus removal	24.3	20.5
need for urgent referral	2.6	2.5

4.3.4 The relationship between the need for oral hygiene instruction, plaque and calculus removal and the need for urgent referral

The need for 'urgent referral' was higher in all age groups amongst those who were deemed to require 'oral hygiene instruction and plaque + calculus removal' than those who required 'oral hygiene instruction only', or those who were deemed to have 'no need for treatment' (Table 4.5). For example, amongst the 707 12-year-olds who were deemed to require 'oral hygiene instruction and plaque + calculus removal', 12.7% were classified as requiring 'urgent referral'. Amongst the 2,050 12-year-olds classified as requiring 'oral hygiene instruction only', and the 1,108 classified as having 'no need for treatment', 1.7% and 1.3% respectively were classified as requiring 'urgent referral'. It might seem strange that some of those deemed to require 'no treatment' would have an 'urgent need for referral'. This is probably explained by the fact that these subjects may have a condition such as ANUG or other conditions requiring further specialist attention or advice.

Table 4.5 The numbers of 5-, 8-, 12- and 15-year-old children and adolescents with codes 'no need for treatment', 'OHI required', 'OHI and plaque + calculus removal', and percentages who are deemed to require urgent referral, in Rol in 2002

	Age Group							
	5		8		12		15	
	n	%	n	%	n	%	n	%
no need for treatment	2910	0.6	1077	0.8	1108	1.3	1174	2.2
OHI required	1672	0.2	2237	1.0	2050	1.7	1531	0.8
OHI + Plaque + Calculus removal	70	4.2	449	14.7	707	12.7	809	9.0

4.3.5 The relationship between the frequency of tooth brushing and the need for oral hygiene instruction, plaque and calculus removal

The parents of 8-year-old children, and the 15-year-old adolescents themselves, completed a questionnaire in which one of the questions concerned the frequency of tooth brushing. The numbers giving the different responses and the percentages of these numbers who were deemed to require no treatment, oral hygiene instruction only, oral hygiene instruction and plaque + calculus removal and urgent referral are presented in Table 4.6. Amongst 8-year-olds, 250 parents claimed that their child brushed their teeth less than once a day, 1,274 once a day, 2,067 twice a day and 60 claimed to brush more than twice a day. Of the 2,067 children whose parents claimed that their 8-year-old child brushed their teeth twice a day, 29.0% were deemed to have 'no need for treatment', 59.4% were deemed to require 'oral hygiene instruction only' and 11.5% were deemed to require 'oral hygiene instruction and plaque + calculus removal'. Only 2.0% were deemed to have 'urgent need for referral'. Amongst 15-year-olds, the percentage deemed to require 'oral hygiene instruction and plaque + calculus removal' tended to decrease as the frequency of toothbrushing increased (Table 4.6). The highest percentage needing 'urgent referral' (8.2%) were from the 25 adolescents who claimed they never brushed their teeth.

Table 4.6 The numbers and percentages of 8- and 15-year-old children and adolescents with codes 'no need for treatment (0)', 'OHI required (1)', 'OHI and plaque + calculus removal (2)', and 'need for urgent referral (r)' according to the frequency of tooth brushing, in Rol in 2002

	Age 8				
	n	0	1	2	r
Never	27	22.4	48.5	29.1	6.1
Less than once a day	250	23.1	63.6	13.3	2.0
Once a day	1274	26.3	62.6	11.2	1.4
Twice a day	2067	29.0	59.4	11.5	2.0
More than twice a day	60	34.4	60.0	5.6	0.0
	Age 15				
	n	0	1	2	r
Never	25	12.3	56.2	31.5	8.2
Less than once a day	311	15.4	58.7	25.9	4.2
Once a day	1149	28.0	49.0	23.0	2.7
Twice a day	1759	38.7	40.8	20.5	2.0
More than twice a day	209	44.2	36.2	19.6	2.6

4.3.6 The relationship between the frequency of visiting the dentist and the need for oral hygiene instruction, plaque and calculus removal

There is no obvious trend amongst 8- and 15-year-olds in the relationship between the frequency of visiting the dentist and oral hygiene treatment need (Table 4.7). For example, amongst 15-year-olds, of the 503 subjects who claimed to visit the dentist every six months or more often, 36.4% required 'no treatment', 43.3% required 'oral hygiene instruction only', 20.3% required 'oral hygiene instruction and plaque + calculus removal' and 2.3% needed 'urgent referral'. The corresponding percentages amongst the 485 subjects who claimed to visit the dentist every 12 to 24 months were slightly higher at 33.0%, 45.4%, 21.6% and 1.8% respectively.

Table 4.7 The numbers and percentages of 8- and 15-year-old children and adolescents with codes 'no need for treatment (0)', 'OHI required (1)', 'OHI and plaque + calculus removal (2)', and 'need for urgent referral (r)' according to how often the child goes to the dentist, in Rol in 2002

	Age 8				
	n	0	1	2	r
Occasionally	914	25.1	63.6	11.2	1.6
Every 6 months or more often	380	28.3	62.7	9.0	1.4
Every 6 - 12 months	741	28.2	60.0	11.7	2.3
Every 12 - 24 months	571	26.0	62.1	11.9	1.8
Every 2 years/more	361	27.7	59.5	12.8	0.6
Never	510	30.6	58.4	11.1	0.9
	Age 15				
	n	0	1	2	r
Occasionally	782	31.7	47.4	21.0	4.4
Every 6 months or more often	503	36.4	43.3	20.3	2.3
Every 6 - 12 months	802	38.1	43.8	18.2	1.4
Every 12 - 24 months	485	33.0	45.4	21.6	1.8
Every 2 years/more	369	28.0	47.0	25.0	2.6
Never	486	27.5	45.4	27.1	2.1

4.3.7 The relationship between snacking habits and the need for oral hygiene instruction, plaque and calculus removal

The parents of 8-year-old children, and 15-year-old adolescents themselves, were asked 'How often does your child (do you) eat sweet food or drink sweet drinks such as Coca-Cola, Pepsi-Cola, 7-up, Ribena, fruit drinks, etc between normal meals?' The most frequent replies were 'less than once a day', 'once a day', 'twice a day', 'three times a day' or 'four times a day' (Table 4.8). There was a slight trend for less oral hygiene treatment to be required by those who consumed sweet foods and drinks between meals less frequently.

Table 4.8 The numbers and percentages of 8- and 15-year-old children and adolescents with codes 'no need for treatment (0)', 'OHI required (1)', 'OHI and plaque + calculus removal (2)', and 'need for urgent referral (r)' according to snacking habits, in Rol in 2002

	Age 8				
	n	0	1	2	r
Never	25	46.8	50.5	2.7	1.4
Less than once a day	488	28.1	59.0	12.9	2.2
Once a day	1163	29.7	59.0	11.3	1.2
Twice a day	1183	26.1	61.8	12.1	2.1
Three times a day	534	27.0	61.9	11.1	1.8
Four times a day	162	22.0	64.5	13.5	3.5

	Age 8				
	n	0	1	2	r
Five times a day	49	25.7	65.2	9.1	0.0
Six times or more a day	35	27.3	58.2	14.5	1.5
Don't know	31	10.6	70.3	19.2	8.6
	Age 15				
	n	0	1	2	r
Never	29	53.9	28.7	17.4	0.0
Less than once a day	285	36.8	45.6	17.6	3.9
Once a day	789	34.7	43.3	22.0	2.7
Twice a day	974	33.6	44.3	22.1	2.3
Three times a day	565	33.3	44.8	21.9	2.1
Four times a day	205	32.6	47.5	19.8	1.4
Five times a day	77	28.9	54.6	16.6	2.3
Six times or more a day	90	23.9	48.3	27.8	1.8
Don't know	451	30.6	47.5	21.9	2.5

Chapter 5

Orthodontic Treatment Need in Rol

5.1 Summary

- Altogether, 23.4% of 15-year-olds had previously undergone orthodontic treatment or were currently undergoing orthodontic treatment. The gender distribution for past orthodontic treatment was fairly even, however more girls (11.5%) than boys (6.8%) were undergoing treatment at the time of examination.
- Orthodontic treatment need was assessed according to whether treatment was needed for aesthetic reasons or due to the presence of occlusal anomalies. Incisor overjet was also measured.
- Overall, 2.5% of 12-year-olds and 1.6% of 15-year-olds had an incisor overjet of greater than, or equal to, 10mm.
- The percentage of 12- and 15-year-olds with an incisor overjet of greater than 6mm was 12.2% and 10.4% respectively.
- Thirty six percent of 12-year-olds and 29.2% of 15-year-olds were recorded as having a definite need for treatment according to either aesthetic reasons or due to the presence of occlusal anomalies.
- Fifteen-year-old adolescents completed a questionnaire, which included the question “How do you feel about the position/alignment of your teeth?” Of the 15-year-olds who answered this question, 62.6% were either very satisfied or satisfied with the position/alignment of their teeth.
- There was a clear pattern of increasing dissatisfaction with the position or alignment of the teeth as orthodontic treatment need increased.
- Altogether, 19.3% of 15-year-olds with a definite need for treatment on aesthetic grounds, and 25.7% of those with a definite need for treatment on dental health grounds would not be willing to wear a brace to straighten their teeth.
- The percentage of 15-year-olds who were under treatment or had completed treatment increased from 13.9% in 1984 to 23.4% in 2002 for Rol as a whole. Since these data were collected, there have been further appointments at consultant and specialist level in public sector orthodontics. This is likely to have led to a further increase in the level of service provision.
- Fifteen year-old dependants of medical card holders were less likely to have had orthodontic treatment than those without medical cards (16.7% vs 26.0%).
- Over half (58.1%) of those without medical cards and just over a quarter (28.4%) of those with medical cards had accessed care privately.

5.2 Introduction

The clinical assessment of 12- and 15-year-old children and adolescents included an assessment of orthodontic treatment need. The questionnaire for 15-year-olds also investigated whether they had their teeth straightened in the past, or were currently undergoing orthodontic treatment, the level of their satisfaction with the alignment of their teeth, and whether they would be willing to wear a brace.

The need for orthodontic treatment among 12-year-old children and 15-year-old adolescents was assessed in Rol only. Treatment need was measured using the Modified Index of Orthodontic Treatment Need (IOTN)¹, an internationally accepted standard for ascertaining orthodontic treatment needs. This index grades the dentition according to aesthetics and function: (1) The Aesthetic Component determines the level of need for orthodontic treatment on aesthetic grounds; (2) The Dental Health Component determines the level of need for orthodontic treatment on dental health grounds – uses Modified IOTN Rod. Each component is assessed independently; the scores are not added together.

The Aesthetic Component: The anterior teeth were rated on their dental attractiveness as seen. They were rated against a photographic 10-point aesthetic scale into one of three categories:

- no need for orthodontic treatment
- a borderline need
- a definite need for orthodontic treatment on aesthetic grounds.

The Dental Health Component (DHC): The DHC is based on occlusal traits and has been simplified for use in screening surveys. Those occlusal traits that have a definite need for orthodontic treatment are recorded. The no need or borderline need categories are recorded as 'no definite need'. Thus, there are two categories:

- no definite need for orthodontic treatment
- a definite need for orthodontic treatment on dental health grounds.

A customised measuring instrument was used for assessing the Dental Health Component. Each subject was examined in a systematic manner for the need for orthodontic treatment due to any of the following five occlusal traits:

- Missing teeth (ectopic canines, congenital absence, impacted teeth (excluding third molars))
- Overjet (both increased overjets >6mm and reverse overjets >=4mm)
- Crossbite (>=4mm)
- Displacement of contact points (crowding)
- Overbite (both increased overbite and open bite >=4mm).

These traits were assessed in order and when definite need was found, the assessment of other traits was discontinued.

The Modified Index of Orthodontic Treatment Need differs from the original IOTN in that it collapses the five grades and 20 sub-categories of the DHC into two categories - definite treatment need and no definite treatment need. The modified index also dichotomises the Aesthetic Component according to whether the children and adolescents have a definite treatment need or no definite treatment need. The rationale being that, for screening surveys, it is essential to clearly identify those individuals classified as having a definite need for orthodontic treatment, but less important to record whether the remaining subjects had a borderline need or no need. In this survey, the dichotomised DHC was used, but borderline need was also included in the Aesthetic Component, which as a result included three categories.

The data are presented here for each component separately, followed by the proportion of the population surveyed who needed treatment according to either classification.

The size of the incisor overjet in mm was also measured for each child and adolescent using a standardised metal ruler. The rationale for including this measurement was that "a horizontal overjet equal to or greater than 10 mm", is a criterion for referral for specialist orthodontic care in the Public Dental Service, according to the commonly used Department of Health Guidelines, DOA 228/2, 22 Eanair 1985. It was of interest to determine the proportion of the population that would qualify for specialist orthodontic care on this criterion alone (there are many others), and what the impact would be of lowering the limit in this criterion to allow referral for care of adolescents with a lower, but definite increased overjet.

5.3 Orthodontic Treatment

Of the 15-year-olds in the sample, 14.2% had previously undergone orthodontic treatment (Table 5.1a); a further 9.2% were currently undergoing orthodontic treatment. The gender distribution for past orthodontic treatment was fairly even, however more girls (11.5%) than boys (6.8%) were undergoing treatment at the time of the fieldwork.

Table 5.1a Percentage of 15-year-olds in RoI according to whether they said they had undergone orthodontic treatment in the past, or were currently undergoing orthodontic treatment, by gender

	Gender		Total
	M	F	
No	79.4	74.1	76.6
Yes	13.8	14.4	14.2
Currently undergoing orthodontic treatment	6.8	11.5	9.2

Among the health board regions (Table 5.1b), adding the percentages currently undergoing treatment to those who reported having completed treatment, the region with the highest percentage either undergoing treatment or with treatment completed was the ECAHB region in the ERHA at 27.3% (17.5% + 9.8%). The region with the lowest percentage was the NAHB region in the ERHA at 18.9% (11.9% + 7.0%), followed by the MWHB region at 20.0% (11.5% + 8.5%).

Table 5.1b Percentage of 15-year-olds in Rol according to whether they said they had undergone orthodontic treatment in the past or were currently undergoing orthodontic treatment by gender and health board region

		Gender		Total
		M	F	
ERHA	No	80.9	74.5	77.5
	Yes	12.7	12.3	12.6
	Currently undergoing orthodontic treatment	6.5	13.3	10.0
ERHA - ECAHB	No	73.6	71.8	72.7
	Yes	17.4	17.6	17.5
	Currently undergoing orthodontic treatment	9.0	10.6	9.8
ERHA - NAHB	No	83.3	79.8	81.1
	Yes	14.4	9.4	11.9
	Currently undergoing orthodontic treatment	2.2	10.9	7.0
ERHA - SWAHB	No	82.9	71.7	77.2
	Yes	8.7	11.7	10.4
	Currently undergoing orthodontic treatment	8.4	16.6	12.5
MHB	No	75.3	71.9	73.5
	Yes	18.8	17.0	17.8
	Currently undergoing orthodontic treatment	5.9	11.1	8.7
MWHB	No	86.4	73.8	80.0
	Yes	6.8	16.2	11.5
	Currently undergoing orthodontic treatment	6.8	10.0	8.5
NEHB	No	75.1	78.6	76.6
	Yes	14.7	13.4	14.2
	Currently undergoing orthodontic treatment	10.2	8.0	9.3
NWHB	No	78.9	72.2	75.2
	Yes	15.9	16.2	16.3
	Currently undergoing orthodontic treatment	5.2	11.6	8.5
SEHB	No	76.8	75.4	76.1
	Yes	17.7	12.9	15.5
	Currently undergoing orthodontic treatment	5.6	11.7	8.3
SHB	No	78.5	70.5	74.6
	Yes	13.9	14.2	13.9
	Currently undergoing orthodontic treatment	7.7	15.3	11.5
WHB	No	79.2	75.8	77.3
	Yes	14.1	19.9	17.2
	Currently undergoing orthodontic treatment	6.7	4.3	5.5

The percentages of 15-year-olds who were currently, or who had previously, accessed orthodontic treatment (Table 5.1b) reflect a combination of treatment delivered, by private practice orthodontists and by orthodontists in the public dental service. Approximately 52.9% of 15-year-olds who had accessed orthodontic treatment had done so through a private orthodontist (Table 5.2). The differences in treatment levels among the health board regions may be due to sociodemographic factors, which influence the rate of uptake of private orthodontic services.

Table 5.2 Percentage distribution of 15-year-olds who were currently undergoing, or who had undergone orthodontic treatment, by type of clinic at which the orthodontic treatment was provided

	Private Dentist n=400	Health Board (school dentist) dental clinic n=304	Dental Hospital n=96
Total	52.9	34.2	14.0

5.3.1 Orthodontic treatment need - Aesthetic Component

In Rol as a whole, 65.3% of 12-year-olds and 72.6% of 15-year-olds had no need for orthodontic treatment on aesthetic grounds (Table 5.3). This percentage ranged from 51.7% in the SEHB region to 71.2% in the NAHB region in the ERHA among 12-year-olds. For the 15-year-old group, the range was from 57.2% in the SEHB region to 85.2% in the ECAHB region in the ERHA. There was a borderline need for treatment among 19.0% of 12-year-olds and 15.3% of 15-year-olds, with a definite need for treatment on aesthetic grounds among 15.7% and 12.2% of these age groups respectively. The variation among the health boards in the definite need for treatment category may be due to the subjective nature of the index, which is based on determining aesthetic equivalence, with one of ten levels of aesthetics depicted by a standardized photographic scale.

Table 5.3 Percentage distribution of 12- and 15-year-olds categorized as having an orthodontic treatment need according to the IOTN Aesthetic Component

Health Board	Age 12			Age 15		
	No Treatment Need	Borderline Need	Definite Need	No Treatment Need	Borderline Need	Definite Need
ERHA	69.7	19.5	10.8	77.7	12.8	9.6
ERHA - ECAHB	68.1	28.1	3.8	85.2	9.7	5.1
ERHA - NAHB	71.2	14.0	14.8	77.2	13.6	9.1
ERHA - SWAHB	69.1	20.0	11.0	73.9	13.8	12.3
MHB	60.1	23.0	17.0	63.9	21.9	14.2
MWHB	65.4	18.8	15.9	76.8	13.1	10.2
NEHB	57.2	28.2	14.6	73.3	17.8	8.9
NWHB	64.7	8.3	27.0	70.3	11.3	18.4
SEHB	51.7	22.7	25.6	57.2	24.9	17.9
SHB	70.1	13.7	16.3	70.6	11.7	17.7
WHB	70.9	17.1	12.0	78.2	16.2	5.6
Rol	65.3	19.0	15.7	72.6	15.3	12.2

5.3.2 Orthodontic treatment need – Dental Health Component

Using the IOTN Dental Health Component (Table 5.4), 65.1% of 12-year-olds and 71.5% of 15-year-olds were reported to have no definite treatment need based on occlusal traits. The variation among the health boards was less for this measure than for the Aesthetic Component. The IOTN Dental Health Component is a very objective index based on specific quantifiable measurements. Thus, 34.9% and 28.5% of 12- and 15-year-olds respectively were assessed as having a definite orthodontic need according to the IOTN Dental Health Component.

Table 5.4 Percentage distribution of 12- and 15-year-olds categorized as having a definite orthodontic treatment need by IOTN Dental Health Component

Health Board	Age 12		Age 15	
	No Definite Treatment Need	Definite Need	No Definite Treatment Need	Definite Need
ERHA	65.5	34.5	71.7	28.3
ERHA - ECAHB	69.7	30.3	76.9	23.1
ERHA - NAHB	63.3	36.8	65.4	34.6
ERHA - SWAHB	65.3	34.7	73.9	26.1
MHB	66.0	34.0	68.0	32.1
MWHB	61.4	38.6	70.4	29.6
NEHB	65.9	34.1	76.7	23.3
NWHB	66.6	33.4	70.8	29.2
SEHB	59.5	40.5	66.0	34.0
SHB	69.5	30.5	72.3	27.7
WHB	64.7	35.3	74.7	25.3
RoI	65.1	34.9	71.5	28.5

The two components of the IOTN are not mutually exclusive: Children with an aesthetic need can also have a dental health need for orthodontic treatment. Thirty six percent of 12-year-olds and 29.2% of 15-year-olds were recorded as having a definite need for treatment according to either one or the other component of the IOTN (Table 5.5). The percentage of 12-year-olds with a definite need for treatment varied from 30.9% in the SHB to 43.0% in the SEHB. For 15-year-olds, this range was from 23.1% in the ECAHB region in the ERHA to 35.5% in the SEHB.

Table 5.5 Percentage distribution of 12- and 15-year-olds categorized by the modified IOTN as having a definite orthodontic treatment need either according to the Aesthetic Component or due to the Dental Health Component

Health Board	Age 12		Age 15	
	No Definite Treatment Need	Definite Need	No Definite Treatment Need	Definite Need
ERHA	65.0	35.1	71.1	28.9
ERHA - ECAHB	68.7	31.3	76.9	23.1
ERHA - NAHB	62.7	37.3	65.2	34.9
ERHA - SWAHB	65.0	35.0	72.6	27.4
MHB	64.3	35.7	67.6	32.5
MWHB	61.0	39.1	69.3	30.7
NEHB	65.3	34.7	76.5	23.5
NWHB	62.0	38.1	68.3	31.7
SEHB	57.0	43.0	64.5	35.5
SHB	69.1	30.9	72.2	27.8
WHB	64.5	35.5	74.7	25.3
RoI	64.0	36.0	70.8	29.2

The 1984 National Survey of Children's Dental Health used a different approach to measure orthodontic treatment need. However, it is interesting to compare the percentage of subjects in the 1984 survey which in the dental clinical opinion did not need orthodontic treatment, with the percentage recorded as having no definite treatment need for either the Aesthetic or Dental Health Component in the 2002 survey. These percentages in 1984 and 2002 respectively, were 58.3% and 64.0% for 12-year-olds and 62.5% and 70.8% for 15-year-olds. Thus, the percentage of children and adolescents reported to have no definite treatment need was higher in 2002. This may be due either to the different criteria used, or to an increase in completed treatments since 1984.

5.4 Distribution of 12- and 15-year-olds according to size of incisor overjet

One of the current Department of Health and Children orthodontic guidelines indicates that children with an incisor overjet of greater than or equal to 10mm should be prioritized for treatment. Overall, 2.5% of 12-year-olds and 1.6% of 15-year-olds would qualify for priority referral for orthodontic treatment under this guideline alone (Table 5.6). Under the IOTN Index, a subject with an incisor overjet of greater than 6mm is categorized as having a definite treatment need. Using this criterion would increase the percentage eligible for prioritization for orthodontic care (by this criterion alone) to 12.2% (9.7% + 2.5%) and 10.4% (8.8% + 1.6%) for 12- and 15-year-olds respectively. It is important, however, to note that children and adolescents can also qualify for prioritization on other grounds.

Table 5.6 Percentage distribution of 12- and 15-year-olds by incisor overjet (mm)

Health Board	Age 12					Age 15				
	<=0	1-3	4-6	7-9	>=10	<=0	1-3	4-6	7-9	>=10
ERHA	1.1	48.9	37.8	10.1	2.1	2.5	54.2	33.3	9.4	0.9
ERHA - ECAHB	0.7	46.9	42.4	9.4	0.7	0.9	63.5	27.7	7.1	0.9
ERHA - NAHB	1.1	51.4	33.0	10.9	3.6	1.2	52.7	35.3	10.9	
ERHA - SWAHB	1.4	47.7	39.7	9.8	1.5	4.5	50.5	34.7	9.4	1.0
MHB	3.0	48.1	38.0	9.2	1.8	2.7	49.4	39.5	6.9	1.5
MWHB	2.4	48.0	38.8	8.5	2.4	1.9	53.8	35.8	7.4	1.1
NEHB	7.8	45.2	34.8	8.7	3.5	10.5	57.4	24.8	5.5	1.9
NWHB	0.7	37.9	45.2	13.0	3.2	3.3	43.9	39.5	10.7	2.6
SEHB	1.0	44.5	41.8	10.4	2.3	3.8	52.9	32.1	9.6	1.6
SHB	11.2	51.6	27.2	8.0	2.0	7.1	58.4	23.1	9.2	2.2
WHB	2.9	40.4	41.8	10.8	4.2	3.7	47.7	37.3	9.2	2.1
Rol	3.6	46.7	37.4	9.7	2.5	4.2	53.3	32.3	8.8	1.6

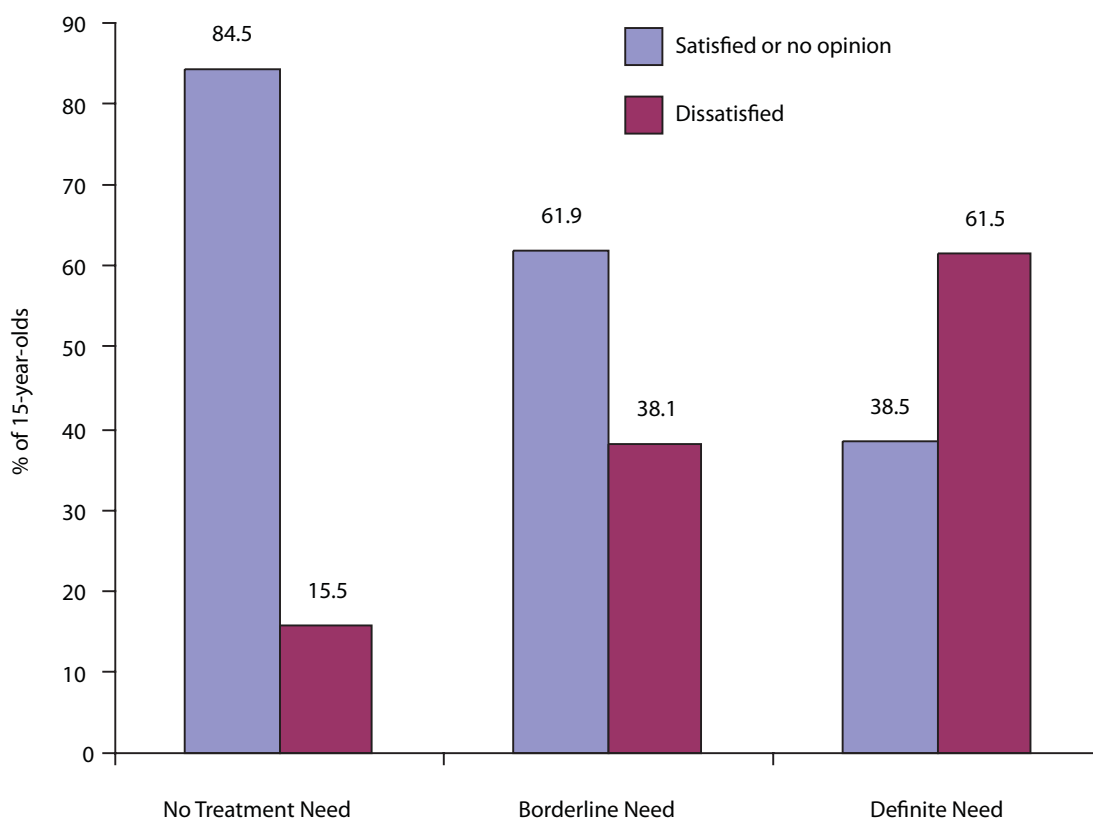
5.5 Satisfaction with position or alignment of the teeth

Fifteen-year-old adolescents completed a questionnaire, which included the question “How do you feel about the position/alignment of your teeth?” Of the 15-year-olds who answered this question, 62.6% (16.2% + 46.4%) were either very satisfied or satisfied with the position/alignment of their teeth (Table 5.7). Satisfaction levels among those with varying levels of treatment need, according to the IOTN Aesthetic Component, indicate high levels of dissatisfaction among those with a definite treatment need for aesthetic reasons. Of the adolescents with no aesthetic treatment need, 12.9% were dissatisfied and 2.6% were very dissatisfied with the position or alignment of their teeth, compared with 44.7% and 16.8% respectively for those with a definite treatment need. The satisfaction ratings are collapsed into two categories to indicate whether 15-year-olds were dissatisfied or not, and are presented according to treatment need, as assessed using the Aesthetic Component of the IOTN in Figure 5.1. Of those with no treatment need, 84.5% were satisfied or had no opinion about the alignment of their teeth, in comparison with 38.5% of those who had a definite treatment need. Thus, a high proportion (38.5%) of those whose teeth would be considered to be in need of orthodontic treatment were not dissatisfied with the appearance/alignment of their teeth. However, there was a clear pattern of increasing dissatisfaction as need increased (Figure 5.1).

Table 5.7 Number and percentage of Rol 15-year-olds by IOTN Aesthetic Component by answer to question “How do you feel about the position/alignment of your teeth?”

	n	Very satisfied	Satisfied	No opinion / indifferent	Dissatisfied	Very Dissatisfied
No Treatment Need	2484	20.6	51.2	12.7	12.9	2.6
Borderline Need	524	6.8	40.6	14.6	31.9	6.2
Definite Need	433	2.7	23.1	12.7	44.7	16.8
TOTAL	3441	16.2	46.4	13.2	19.2	5.0

Figure 5.1 Percentage of Rol 15-year-olds by IOTN Aesthetic Component by answer to question “How do you feel about the position/alignment of your teeth?”



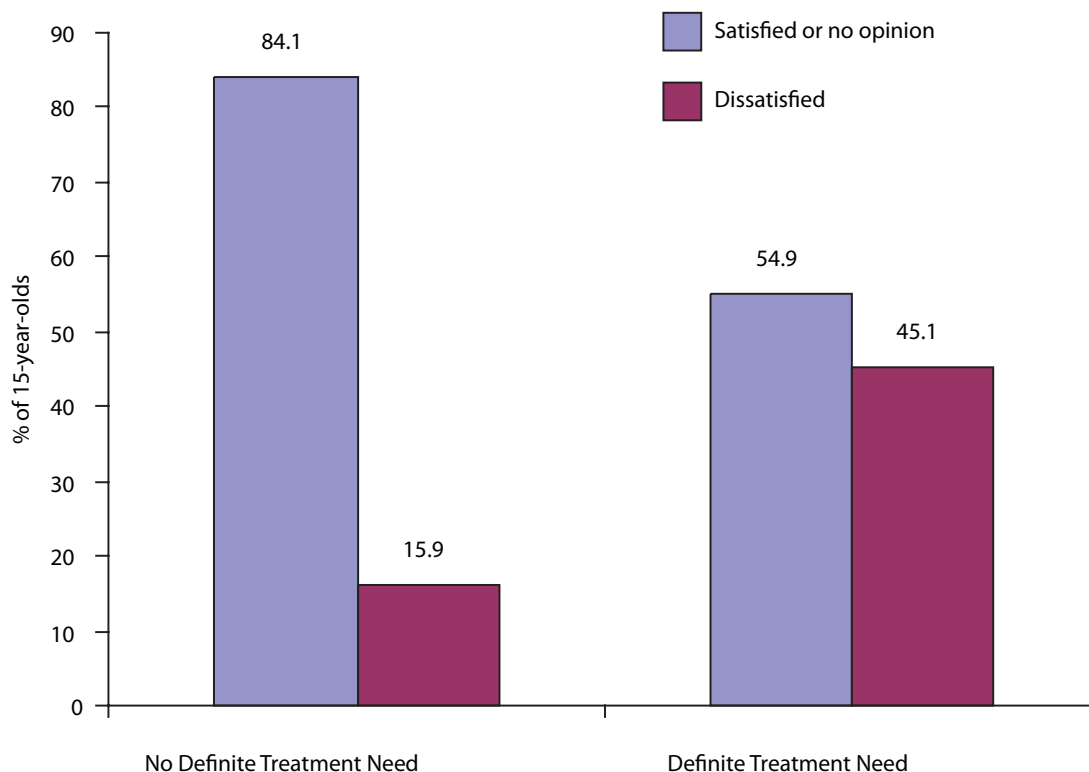
Similarly, 15-year-olds with treatment need due to occlusal traits, as assessed by the IOTN Dental Health Component, were less likely to be satisfied with the position, or alignment, of their teeth if they had a definite treatment need as compared with no definite treatment need (Table 5.8). Approximately 10.7% of those with a definite treatment need were very dissatisfied with the position or alignment of their teeth, as compared with 2.7% with no definite treatment need.

Table 5.8 Number and percentage of Rol 15-year-olds by IOTN Dental Health Component by answer to question “How do you feel about the position/alignment of your teeth?”

	n	Very Satisfied	Satisfied	No opinion / indifferent	Dissatisfied	Very Dissatisfied
No treatment need	2426	20.5	51.1	12.5	13.2	2.7
Definite need	1016	5.2	35.3	14.5	34.4	10.7
TOTAL	3442	16.2	46.4	13.2	19.2	5.0

Dissatisfaction levels (% dissatisfied + % very dissatisfied) were higher at 61.5% among those with a definite treatment need for aesthetic reasons (Figure 5.1) than those with a definite treatment need for dental health reasons at 45.1% (Figure 5.2).

Figure 5.2 Percentage of Rol 15-year-olds by IOTN Dental Health Component by answer to question “How do you feel about the position/alignment of your teeth?”



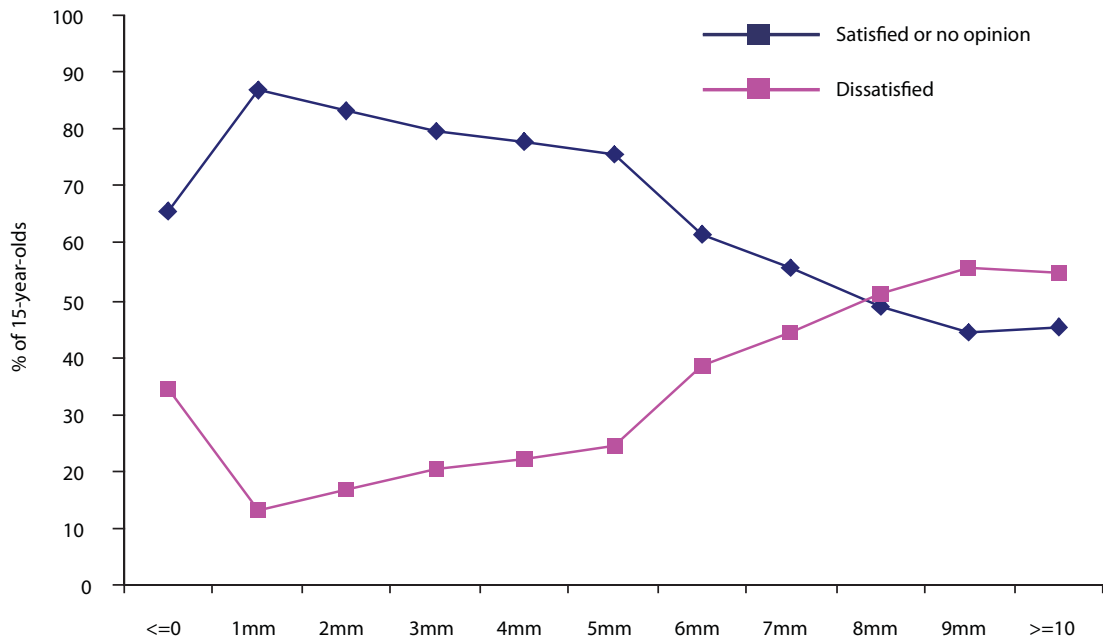
Levels of satisfaction with the position or alignment of the teeth were lower among those with an edge to edge or negative overjet. Of this group (n = 196), only 3.4% were very satisfied and 38.9% satisfied with the position or alignment of their teeth. The highest levels of satisfaction were found amongst those with overjets of 1mm (n = 272) and 2mm (n = 745), with 19.4% very satisfied and 55.6% satisfied with a 1mm overjet, and 22.1% very satisfied and 49.2% satisfied with a 2mm overjet. Dissatisfaction levels were highest amongst the 186 15-year-olds with an overjet greater than or equal to 8mm, more than 50% of whom were either dissatisfied or very dissatisfied with the position or alignment of their teeth.

Table 5.9 Percentage of Rol 15-year-olds by overjet (mm) by answer to question “How do you feel about the position/alignment of your teeth?”

	<=0	1mm	2mm	3mm	4mm	5mm	6mm	7mm	8mm	9mm	>=10
n	196	272	745	782	584	354	176	180	76	56	54
Very satisfied	3.4	19.4	22.1	18.1	14.1	12.5	13.2	4.8	2.6	3.2	1.0
Satisfied	38.9	55.6	49.2	48.3	49.1	47.2	37.4	37.8	36.6	27.3	36.8
No opinion/indifferent	23.4	11.8	11.8	13.2	14.7	16.0	10.8	13.3	9.6	13.7	7.7
Dissatisfied	22.6	10.4	14.2	17.1	17.2	19.6	32.4	33.5	36.3	43.5	46.8
Very Dissatisfied	11.7	2.9	2.8	3.3	4.8	4.7	6.2	10.7	14.9	12.3	7.8

Adolescents with overjets of 1-2mm are the most satisfied with the position or alignment of their teeth (Figure 5.3). Beyond this level, satisfaction levels decrease and dissatisfaction levels increase.

Figure 5.3 Percentage of Rol 15-year-olds by overjet (mm) by answer to question “How do you feel about the position/alignment of your teeth?” Very satisfied, satisfied and no opinion are collapsed into the ‘Satisfied or no opinion’ category. Dissatisfied and Very dissatisfied are collapsed into the ‘Dissatisfied’ category



It is interesting to note that 19.3% of those with a definite need and 29.1% with a borderline need for treatment on aesthetic grounds would not be willing to wear a brace to straighten their teeth (Table 5.10).

Table 5.10 Number and percentage of Rol 15-year-olds by IOTN Aesthetic Component by answer to question “Would you be willing to wear a brace to straighten your teeth?”

	n	Yes	No	Never thought about it	Undergoing treatment	Awaiting treatment
No treatment need	2048	29.7	36.0	22.9	10.1	1.2
Borderline need	477	40.9	29.1	17.9	4.3	7.8
Definite need	396	38.7	19.3	9.9	13.0	19.2
TOTAL	2921	32.9	32.8	20.1	10.0	4.3

The proportion of 15-year-olds not willing to wear a brace, but who had a definite need for treatment under the IOTN Dental Health Component, was 25.7% (Table 5.11). This is an important consideration when planning orthodontic services, since if children who need orthodontic services do not want to wear a brace, uptake will be lower than anticipated from needs assessment based on the IOTN alone.

Table 5.11 Number and percentage of Rol 15-year-olds by IOTN Dental Health Component by answer to question “Would you be willing to wear a brace to straighten your teeth?”

	n	Yes	No	Never thought about it	Undergoing treatment	Awaiting treatment
No Definite Treatment Need	2015	30.9	35.8	22.7	9.4	1.2
Definite need	907	37.4	25.7	14.4	10.8	11.7
TOTAL	2922	32.9	32.8	20.1	10.0	4.3

Although adolescents with an overjet of 10mm or greater are prioritized for referral for orthodontic treatment, only 8.9% of them were undergoing treatment and a further 15.4% were awaiting treatment (Table 5.12). Just under half (48.1%) of these adolescents were willing to wear braces, but appear not to have been picked up by the system. Many 15-year-olds with increased overjets would be unwilling to wear a brace to straighten their teeth.

Table 5.12 Number and percentage of Rol 15-year-olds by overjet (mm) by answer to question “Would you be willing to wear a brace to straighten your teeth?”

	n	Yes	No	Never thought about it	Undergoing treatment	Awaiting treatment
<=0 mm	173	28.4	29.3	11.0	13.4	18.0
1-3 mm	1503	31.1	35.4	21.8	9.9	1.9
4-6 mm	948	35.3	32.3	20.7	7.4	4.2
7-9 mm	275	36.6	23.4	14.8	13.7	11.5
>=10 mm	52	48.1	24.1	3.5	8.9	15.4
TOTAL	2951	32.9	32.8	20.1	10.0	4.3

5.6 Changes in proportion treated or under treatment between 1984 and 2002

Since 1984, the specialty of Orthodontics has been recognised in Ireland, and a number of consultant and specialist appointments have been made. Progress in meeting the need for orthodontic treatment is illustrated in Table 5.13. Of particular note are the data showing the percentage of 15-year-olds for whom treatment is completed or underway in 2002 and 1984. Comparing these two sets of data, it is encouraging to note that the percentage either under treatment, or who had completed treatment, rose from 13.9% in 1984 to 23.4% in 2002 for Rol as a whole. The treatment statistics in 2002 were highest in the ECAHB region in the ERHA (27.3%) followed by the MHB region (26.5%), and lowest in the NAHB region in the ERHA (18.9%) followed by the MWHB region (20.0%).

Since these data were collected, there have been further appointments at consultant and specialist level in public sector orthodontics; this is likely to lead to a further increase in the level of service provision.

Table 5.13 Percentage of 15-year-olds currently undergoing or with past orthodontic treatment in 2002 and in 1984

Health Board	15-year-olds 2002 % responses to question: “Have you had orthodontic treatment in the past (i.e., braces or appliances to straighten your teeth)?”				15-year-olds 1984 Information obtained during clinical examination		
	No	Yes	Currently undergoing orthodontic treatment	Either under treatment or completed	Treatment completed	Currently undergoing orthodontic treatment	Either under treatment or completed
ERHA	77.5	12.6	10.0	22.6	12.5	7.0	19.5
ERHA - ECAHB	72.7	17.5	9.8	27.3			
ERHA - NAHB	81.1	11.9	7.0	18.9			
ERHA - SWAHB	77.2	10.4	12.5	22.8			
MHB	73.5	17.8	8.7	26.5	5.8	1.5	7.3
MWHB	80.0	11.5	8.5	20.0	6.0	5.0	11.0
NEHB	76.6	14.2	9.3	23.4	5.9	5.3	11.2
NWHB	75.2	16.3	8.5	24.8	9.0	8.7	17.7
SEHB	76.1	15.5	8.3	23.9	17.0	0.6	17.6
SHB	74.6	13.9	11.5	25.4	10.0	3.6	13.6
WHB	77.3	17.2	5.5	22.7	12.1	1.3	13.4
Rol	76.6	14.2	9.2	23.4	9.7	4.2	13.9

Most orthodontic treatment in Ireland is provided as a secondary care service. The treatment is costly and, although it is tax deductible, would not be affordable by the less well off. Thus, for many of the less well off, the Public Dental Service is the only source of treatment for those who need it. Table 5.14 shows the distribution of 15-year-olds according to orthodontic treatment status and disadvantage. In total, 26.0% of non disadvantaged 15-year-olds had either completed orthodontic treatment (15.5%), or were currently undergoing treatment (10.5%). This compares with 16.7% of the less well off (11.6% completed and 5.1% undergoing treatment).

Table 5.14 Percentage responses by 15-year-olds to question: Have you had orthodontic treatment in the past (i.e., braces or appliances to straighten your teeth)? Data presented by disadvantage status (disadvantaged are dependants of medical card holders; non disadvantaged are dependants of non medical card holders)

	Disadvantaged	Non disadvantaged	Total
No	83.3	74.0	76.6
Yes	11.6	15.5	14.2
Currently undergoing orthodontic treatment	5.1	10.5	9.2

When asked where they had received their treatment, the sources of treatment for those who had orthodontic treatment varied according to disadvantage status. Altogether, 58.1% of the non disadvantaged and 28.4% of the disadvantaged had treatment at a private dentist, 31.3% and 52.8% had treatment at a health board dentist, and 11.5% and 20.5% had treatment at a dental hospital (Table 5.15). These figures illustrate the importance of the Public Dental Service in providing accessible orthodontic services, especially to those classified as disadvantaged.

Table 5.15 Weighted percentage distribution of 15-year-olds who were currently undergoing or who had undergone orthodontic treatment by type of clinic at which the treatment was provided

	Private Dentist	Health Board (school dentist) dental clinic	Dental Hospital
Disadvantaged (n= 162)	28.4	52.8	20.5
Non disadvantaged (n=638)	58.1	31.3	11.5

Dependants of medical card holders were less likely to have had orthodontic treatment than those without medical cards (16.7% vs 26.0%). Over half (58.1%) of those without medical cards and just over a quarter (28.4%) of those with medical cards had accessed care privately. Thus, the differential in the proportion of disadvantaged and non disadvantaged groups accessing orthodontic treatment appears to be due to uptake of private services.

REFERENCES:

- I Burden,DJ., Pine, C.M., Burnside, G. (2001): Modified IOTN: an orthodontic treatment need index for use in oral health surveys. *Community Dentistry and Oral Epidemiology*. 29(3):220-225.

Chapter 6

Trauma to Permanent Incisors in RoI and NI

6.1 Summary

- Amongst 8-year-olds, in the Republic of Ireland (RoI), 5.9% had evidence of traumatic injuries to their permanent incisors, amongst 12-year-olds this figure was 19.5%, and amongst 15-year-olds it was 22.4%. The prevalence of traumatic injuries in corresponding age groups in Northern Ireland (NI) were predominantly lower at 6.3%, 15.4% and 14.7%.
- The prevalence of traumatic injuries to permanent incisors was higher amongst males than amongst females in RoI and NI.
- The prevalence of traumatic injuries to permanent incisors amongst children and adolescents in RoI had not changed since 1984.
- A high proportion of traumatic injuries to the permanent incisors of children in RoI remain untreated, a phenomenon also reported in 1984.
- Traumatic injuries to upper permanent incisors of children and adolescents in RoI were higher amongst those with an increased overjet ('prominent teeth').

6.2 Introduction

During the dental examination, the examiners in RoI and NI assessed each permanent incisor in 8-, 12- and 15-year-old children for evidence of damage. For each incisor with evidence of trauma, the dentists recorded the type of trauma sustained, and any treatment that the child received for that trauma. The criteria used to assess the presence of trauma to front permanent teeth were the same as those used in the National Survey of Children's Dental Health conducted in RoI in 1984¹ and were as follows:

- 0** No evidence of trauma
- E** Enamel Fracture (not restored)
- I** Discolouration
- 2** Fracture involving enamel and dentine (not restored)
- 3** Fracture involving enamel, dentine and pulp (not restored)
- 4** Missing due to trauma
- 5** Acid-etch composite restoration (or rebonding of fractured portion of tooth) which had been placed to repair trauma
- 6** Semi-permanent restorations (treatment ongoing), e.g., stainless steel crowns, pinch bands, cellulose acetate crown, 'Directa' crowns, and pinned inlays
- 7** Permanent restorations (treatment complete), e.g., Porcelain bonded crown
- 8** Denture provided due to traumatic loss
- B** Bridge provided due to traumatic loss
- P** Implant provided due to traumatic loss
- X** Assessment cannot be made, there is no permanent incisor and it had not been lost due to trauma

6.3 Prevalence of traumatic injuries to permanent incisors in RoI and NI

The prevalence of traumatic injuries to permanent incisors increased with age (Table 6.1). Amongst 8-year-olds in RoI, 5.9% had evidence of traumatic injuries to their permanent incisors, amongst 12-year-olds this figure was 19.5%, and amongst 15-year-olds it was 22.4%. The pattern is similar in NI, but the prevalence is lower in NI with 16.2% of males and 13.3% of females aged 15 years having evidence of trauma, compared to 28.6% of males and 16.5% of females of the same age group in RoI.

Table 6.1 Number and percentage of children (8-, 12- and 15-year-olds) by gender in Rol and NI who had any trauma

Region	Gender	Age 8		Age 12		Age 15	
		n	%	n	%	n	%
Rol	Male	140	7.7	420	23.0	490	28.6
	Female	82	4.3	293	16.2	275	16.5
	Total	222	5.9	713	19.5	765	22.4
NI	Male	16	10.1	34	20.9	50	16.2
	Female	3	2.1	19	10.4	43	13.3
	Total	19	6.3	53	15.4	93	14.7

Many of the minor enamel fractures recorded are of less clinical significance than more extensive fractures from the point of view of the treatment required. Furthermore, it can be difficult to differentiate enamel fractures from wear. Also, without a clinical investigation, discolouration poses a challenge to the assessment of treatment need due to trauma. Consequently, reports of dental trauma frequently exclude enamel trauma and discolouration (Table 6.2). It can be seen that the prevalence of children with at least one incisor with such injuries is substantially higher in males than in females and higher in Rol than in NI. For example, amongst 15-year-olds in Rol, 9.4% were affected, compared with 6.3% in NI ($p < 0.05$). A similar, but not significant, trend is evident amongst 8-year-olds ($p > 0.05$) and 12-year-olds ($p > 0.05$). It has been widely reported that the prevalence of traumatic injuries to permanent incisors tends to be higher amongst males than amongst females^{1,2}. There is no obvious explanation for the higher prevalence of these injuries amongst children in Rol than in NI.

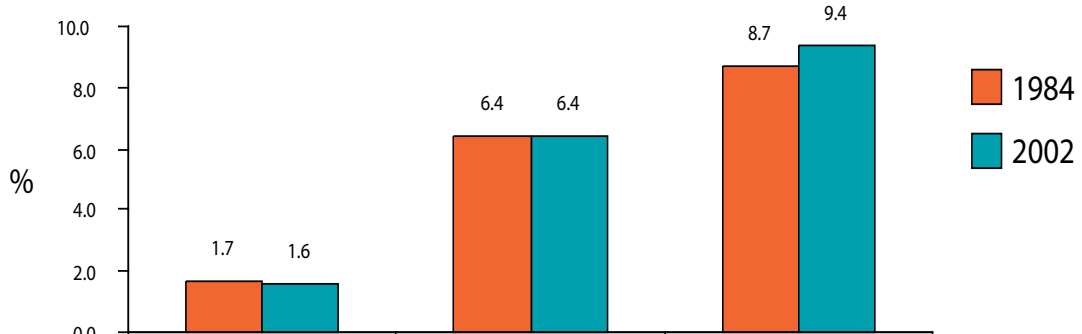
Table 6.2 Number and percentage of children (8-, 12- and 15-year-olds) in Rol and NI who had trauma present (excluding enamel fractures and discolouration) by gender

Region	Gender	Age 8		Age 12		Age 15	
		n	%	n	%	n	%
Rol	Male	36	2.0	142	7.6	203	12.0
	Female	24	1.2	98	5.3	109	6.9
	Total	60	1.6	240	6.4	312	9.4
NI	Male	4	2.5	12	7.4	22	7.1
	Female	0	0.0	5	2.8	18	5.6
	Total	4	1.3	17	4.9	40	6.3

6.4 Changes in the prevalence of traumatic injuries to permanent incisors in Rol since 1984

Accidental trauma to the front teeth was measured in the National Survey of Children's Dental Health in 1984¹, using the same criteria as used in this study (Figure 6.1). The prevalence of these injuries has not changed since 1984.

Figure 6.1 Percentage of 8-, 12- and 15-year-old children and adolescents who have at least one traumatised permanent incisor (excluding discolouration and enamel fractures) in Rol in 1984 and 2002



6.5 Children with traumatic injuries to permanent incisors who require treatment

A high proportion of traumatic injuries to the permanent incisors of children in Rol remain untreated - a phenomenon also reported in 1984¹ (Table 6.3). For example, of the 3,883 12-year-olds examined in 2002, 6.4% had one or more traumatic injuries affected by trauma at least into dentine. Of these children, 38.9% required treatment for their traumatic injury. The corresponding figures for the 2,340 12-year-olds examined in 1984 were 6.4% and 37.2%. The percentage of traumatic injuries to permanent incisors that were untreated was lower in NI than in Rol. The high level of untreated traumatic injuries to permanent incisors amongst children in Rol in 2002 is a cause for concern. It could be hypothesised that, with the development of highly effective acid-etch composite techniques for the management of many of these injuries over the last 20 years (see Table 6.4), the level of untreated injuries would fall. Further research is indicated to determine the reason for the low level of treatment provided for injured permanent incisors in Rol.

Table 6.3 Number and percentage of children and adolescents (8-, 12- and 15-year-olds) with at least one permanent incisor affected by trauma (excluding enamel fractures and discolouration), and percentage of children with traumatic injuries requiring treatment in Rol in 1984 and 2002 and NI in 2002

Age group	Year of study	Number of children examined	% of children with traumatic injury	% of children with treatment need
8	Rol 1984	2378	1.7	30.4
	Rol 2002	3776	1.6	47.8
	NI 2002	303	1.3	25.0
12	Rol 1984	2340	6.4	37.2
	Rol 2002	3883	6.4	38.9
	NI 2002	346	4.9	35.3
15	Rol 1984	2453	8.7	47.4
	Rol 2002	3535	9.4	41.9
	NI 2002	633	6.3	22.5

6.6 Type of traumatic injury and treatment

The types of traumatic injury sustained ranged from 'discolouration' and 'enamel fracture' to the actual loss of a tooth. The types of treatment provided included acid-etch composite restoration and the provision of a denture. In addition, 'other' treatments such as the provision of a bridge or other permanent restorations were considered, though these were rarely seen (Table 6.4).

Amongst 12-year-olds, in Rol in 2002, 913.6 upper central incisors per thousand showed 'no evidence' of traumatic injury, 2.1 per thousand had 'discolouration', 55.9 had fractures involving 'enamel only' and 5.8 had fractures involving 'enamel and dentine'. 'Fractures involving pulp' and upper central incisors

'missing due to trauma' were rarely seen. Amongst 15-year-olds, the distribution of the types of injury sustained was similar to that seen in 12-year-olds. There was a noticeable increase between 1984 and 2002 in the number of upper permanent central incisors per thousand, which were restored using an acid-etch composite resin. The increase was from 11.3 per thousand to 20.6 per thousand amongst 12-year-olds, and from 14.3 per thousand to 24.7 per thousand amongst 15-year-olds. The distribution of the different types of injuries sustained to permanent incisors in NI was similar to that in Rol.

Table 6.4 Type of accidental injury sustained per 1,000 upper central incisors for 12- and 15-year-olds, in Rol in 1984 and 2002 and NI in 2002

	Age 12		
	Rol 1984	Rol 2002	NI 2002
No evidence of trauma	923.5	913.6	934.8
Discolouration	2.4	2.1	0.0
Fracture (Enamel)	44.0	55.9	39.1
Fracture (Enamel and Dentine)	12.4	5.8	8.7
Fracture (involving pulp)	2.1	0.0	0.0
Missing due to trauma	1.7	0.8	0.0
Acid-etch composite restoration	11.3	20.6	17.4
Denture provided	0.4	0.5	0.0
Other	2.1	0.6	0.0
	Age 15		
	Rol 1984	Rol 2002	NI 2002
No evidence of trauma	928.5	896.2	930.4
Discolouration	4.5	1.6	4.0
Fracture (Enamel)	27.8	62.1	32.4
Fracture (Enamel and Dentine)	12.3	10.5	4.0
Fracture (involving pulp)	3.1	0.3	0.0
Missing due to trauma	2.5	1.1	0.8
Acid-etch composite restoration	14.3	24.7	26.1
Denture provided	3.1	0.3	0.0
Other	4.1	3.3	2.4

6.7 Traumatic injuries and overjet

Previous studies have indicated that the prevalence of injuries to permanent incisors tends to be higher amongst those children with an increased overjet³. Amongst 12-year-olds in 2002, 13.7% of those deemed to have an overjet less than or equal to 5mm were found to have traumatised one or more of their permanent upper central incisors, whereas amongst those deemed to have an overjet greater than 5mm 18.2% had such an injury ($p < 0.005$) (Table 6.5). A similar relationship is seen in 15-year-olds where 16.0% of those with an overjet less than or equal to 5mm had traumatic injury to their upper permanent incisors, in comparison with 22.7% of those who had an overjet greater than 5mm ($p < 0.005$).

The above findings suggest that the correction of an increased overjet by orthodontic treatment may also have a role to play in the prevention of traumatic injuries to permanent incisors. However, the correction of protrusive malocclusions generally does not occur before the age of 12 years, and quite a high proportion of traumatic injuries to permanent incisors have occurred by this age. Hence, the efficiency of this approach to the prevention of traumatic injuries to permanent incisors should not be overstated. The wearing of protective mouthguards when playing contact sports, especially by those with an increased overjet, is probably, based on available evidence, the most sensible approach that can be adopted in the prevention of traumatic injuries to permanent incisors.

Table 6.5 The prevalence of trauma to one or more permanent upper central incisors among 12- and 15-year-olds with an incisor overjet ≤ 5 mm and > 5 mm in Rol in 1984 (unweighted) and 2002 (weighted) (percentages for 2002 differ from percentages calculated using numbers,

as they are weighted)

	Overjet ≤5mm						Overjet >5mm					
	1984			2002			1984			2002		
Age	Total	Trauma	%	Total	Trauma	%	Total	Trauma	%	Total	Trauma	%
12	1646	252	15.3	3169	426	13.7	360	82	22.8	680	123	18.2
15	1812	265	14.6	2929	469	16.0	304	72	23.7	544	117	22.7

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Chapter 7

Toothwear in Rol

7.1 Summary

- Toothwear on the permanent anterior teeth was recorded once it had progressed through the tooth enamel and into the dentine.
- Toothwear increased with age: 17.4% of 12-year-old children and 29.7% of 15-year-old adolescents had dentine exposed on at least one anterior permanent tooth.
- Most of the toothwear recorded occurred on incisal surfaces.
- Fifteen-year-olds who brushed once a day or less had more toothwear than those brushing more frequently.
- Fifteen-year-olds, who use their toothbrush to rinse their teeth after brushing, had less toothwear than those who rinse their teeth after brushing using a different method (glass, cupping hands, rinsing directly from the tap).

7.2 Introduction

Individuals are now retaining more of their natural teeth, making it necessary that wear of the anterior teeth be recorded. This was the first national survey of children's oral health in the Republic of Ireland (Rol) to record toothwear. Toothwear was reported for the permanent teeth in the 12-year-old and 15-year-old age groups in Rol only; it was not recorded in NI. In addition, the 15-year-olds completed a questionnaire on oral hygiene and dietary practices. In total, 3,861 12-year-olds, and 3,517 15-year-olds were examined for toothwear by the 32 teams of trained examiners (Table 7.1).

Table 7.1 Numbers examined by age group and gender for toothwear in Rol in 2002

	Age 12	Age 15
Male	1879	1772
Female	1982	1745
Total	3861	3517

The term 'toothwear' is an all-encompassing term used to describe the non carious loss of tooth tissue, which may have occurred due to erosion, attrition or abrasion, and possibly abfraction. The different types of wear are descriptive but also depend on establishing, where possible, the aetiology.

Erosion is the dissolution of teeth by acids, attrition is the wear of tooth against tooth, and abrasion is the wear of teeth from other factors^{1,2}. Abfraction is the non-carious loss of cervical tooth tissue possibly associated with occlusal loading³.

It is generally agreed that although toothwear can be defined as distinct entities, it is not possible to make these clear distinctions at survey level, and it is probable that all types contribute, the dominant one being dependent on age and the interactions between physiological, biological and chemical factors. Toothwear in this survey is therefore reported collectively rather than by individual types of wear.

7.3 Measurement

The index used was the same as that used in the Oral Health of Irish Adults survey in 2000/02⁴, and in the Adult Dental Health Survey in the United Kingdom in 1998⁵. It is a descriptive index using partial recording; the labial, incisal and palatal surfaces of the upper six permanent anterior teeth were scored. On the upper incisal surfaces, wear typical of erosion was also scored if present. The condition of the most worn surface of the lower six permanent anterior teeth was also recorded⁶. Wear was recorded when it had already progressed through tooth enamel into the dentine, as considerable examiner variability has been reported when trying to record wear confined to tooth enamel⁷.

The classifications mild, moderate and severe are used in the report. They are described as:
Mild: toothwear just exposing the dentine (code 1);
Moderate: toothwear exposing the dentine for more than one third of the individual surface (code 2);
Severe: complete loss of tooth enamel with the pulp or secondary dentine exposed (code 3).
The code 0 was assigned when there was no wear into dentine.

An individual was reported to have toothwear when a score of 1 or more was assigned to at least one anterior permanent tooth; the maximum score for the individual is recorded.

7.4 Results

The tables in this chapter present results for maximum level of any toothwear for RoI as a whole, by age group and gender. The results for the individual health boards and health authorities as they were prior to the Health Act, 2004⁸, are presented in the appendices on the accompanying CD.

The following parameters are reported: the presence of toothwear on any one of the three surfaces of the index teeth, the presence of toothwear affecting the incisal surfaces of the upper anterior teeth, the presence of toothwear affecting lower incisal surfaces, and the presence of toothwear affecting the smooth labial or palatal surfaces. On the lower teeth, the incisal surfaces were the most worn.

The level of toothwear in 12- and 15-year-olds, in 2002, is presented in Table 7.2. In both age groups, males had more toothwear than females. In RoI, the percentage of 12-year-olds with toothwear exposing dentine on at least one surface was 17.4%; most had toothwear in the mild category (16.6%). The prevalence of toothwear had increased in the older age group, where 29.7% of 15-year-olds had toothwear; again the majority had toothwear at the mild level (27.9%).

Table 7.2 Percentage according to maximum level of toothwear by age group and gender

	Age 12					
	Male		Female		All RoI	
	%	n	%	n	%	n
Mild	18.5	356	14.8	291	16.6	647
Moderate	1.0	19	0.5	14	0.7	33
Severe	0.2	2	0.0	1	0.1	3
Any Toothwear	19.6	377	15.3	306	17.4	683
	Age 15					
	Male		Female		All RoI	
	%	n	%	n	%	n
Mild	29.9	520	25.8	443	27.9	963
Moderate	1.6	39	1.2	28	1.4	67
Severe	0.2	2	0.5	6	0.4	8
Any Toothwear	31.7	561	27.5	477	29.7	1038

Table 7.3 shows regional variations that existed in the prevalence of toothwear for both age groups in 2002. For instance, in the SEHB region, 1.8% of all 12-year-olds had toothwear, compared to 36.5% in the MHB and 54.5% in the ECAHB region in the ERHA. In the 15-year-old age group, 7.7% in the WHB exhibited toothwear compared to 48.7% in the ERHA and 77.9% in the ECAHB region in the ERHA. Further investigation would be required to establish whether these are true differences, or whether differences are due to factors such as examiner variation.

Table 7.3 Percentage with any toothwear by age group and health board

	Age 12		Age 15	
	%	n	%	n
ERHA	29.5	275	48.7	430
ERHA-ECAHB	54.5	124	77.9	180
ERHA-NAHB	27.3	91	36.9	116
ERHA-SWAHB	19.2	60	41.9	134
MHB	36.5	122	46.4	122
MWHB	18.7	87	35.1	150
NEHB	16.1	55	23.0	82
NWHB	15.2	42	28.1	67
SEHB	1.8	9	9.0	38
SHB	6.8	88	11.9	115
WHB	2.1	5	7.7	34

When the prevalence of toothwear is reported according to the surfaces affected, it can be seen that most of the toothwear was recorded on incisal surfaces. The proportion of 12-year-olds with toothwear on at least one upper incisal surface was 11.5%; with almost all wear being confined to the mild level (11.3%) (Table 7.4). In the 15-year-old age group, 21.8% had toothwear on one or more upper incisal surfaces, most being at the mild level (20.7%).

Table 7.4 Percentage according to maximum level of toothwear on upper incisal surfaces by age group and gender

	Age 12					
	Male		Female		All Rol	
	%	n	%	n	%	n
Mild	12.4	241	10.3	203	11.3	444
Moderate	0.2	5	0.2	4	0.2	9
Severe	0.0	0	0.0	0	0.0	0
Any Toothwear	12.6	246	10.5	207	11.5	453
	Age 15					
	Male		Female		All Rol	
	%	n	%	n	%	n
Mild	22.3	382	18.9	325	20.7	707
Moderate	0.8	15	0.7	11	0.7	26
Severe	0.0	0	0.7	1	0.4	1
Any Toothwear	23.1	397	20.3	337	21.8	734

When toothwear on the lower incisal surfaces was examined, 12.5% of 12-year-olds had toothwear almost all again being mild (12.2%) (Table 7.5), and 22.2% of 15-year-olds had toothwear, predominantly mild (20.7%).

Table 7.5 Percentage according to maximum level of toothwear on lower incisal surfaces by age group and gender

	Age 12					
	Male		Female		All Rol	
	%	n	%	n	%	n
Mild	14.0	272	10.5	204	12.2	476
Moderate	0.3	6	0.3	6	0.3	12

	Age 12					
	Male		Female		All Rol	
	%	n	%	n	%	n
Severe	0.0	0	0.0	0	0.0	0
Any Toothwear	14.3	278	10.8	210	12.5	488
	Age 15					
	Male		Female		All Rol	
	%	n	%	n	%	n
Mild	22.3	388	19.2	332	20.7	720
Moderate	0.8	17	0.9	18	0.8	35
Severe	0.0	0	1.3	2	0.7	2
Any Toothwear	23.1	405	21.4	352	22.2	757

Toothwear on the incisal surfaces of the upper teeth was also recorded according to whether it was considered typical of erosion. The proportion with toothwear considered typical of erosion was very low in both age groups: 0.2% (n = 4) in the 12-year-old age group, and 0.6% (n = 10) in the 15-year-old age group. Erosion was recorded when the surface of exposed dentine was surrounded by a higher periphery of enamel, in descriptive terms this was considered 'moderate' toothwear. As the prevalence of 'moderate' toothwear in the entire sample was low in both age groups, identifying toothwear typical of erosion was unlikely, possibly due to the relatively young age of the subjects, and the co-existence of erosion, abrasion and attrition.

The prevalence of toothwear on the smooth labial and palatal surfaces is presented by fluoridation status in Table 7.6. Fluoride exerts its greatest benefit on smooth surfaces: 3.1% of 12-year-olds and 3.6% of 15-year-olds had wear on the smooth labial and palatal surfaces. In a UK study⁹ of tooth wear in 14-year-olds, children in non fluoridated areas were 1.5 times more likely to have smooth surface wear than those in fluoridated areas. Similarly, in this study a greater percentage of 12-year-olds in non fluoridated areas had moderate wear (2.0%) compared with fluoridated areas (0.4%). However, this difference although slight, was in the opposite direction for 15-year-olds, thus making it difficult to draw conclusions on the association between fluoridation and wear from these data. These data provide a baseline against which future trends in the prevalence and distribution of wear can be monitored.

Table 7.6 Percentage according to maximum level of toothwear on upper labial and palatal surfaces by age group and fluoridation status

	Age 12					
	Full FI		Non FI		All Rol	
	%	n	%	n	%	n
Mild	3.1	69	3.6	15	2.7	128
Moderate	0.4	5	2.0	5	0.4	11
Severe	0.0	0	0.0	0	0.0	0
Any Toothwear	3.5	74	5.6	20	3.1	139
	Age 15					
	Full FI		Non FI		All Rol	
	%	n	%	n	%	n
Mild	3.5	69	3.6	46	3.3	143
Moderate	0.3	5	0.1	2	0.3	8
Severe	0.0	0	0.0	0	0.0	0
Any Toothwear	3.8	74	3.7	48	3.6	151

7.5 The prevalence of toothwear by disadvantage

Toothwear was examined in relation to inequalities in oral health (Table 7.7). It is generally recognised that disadvantaged members of society tend to have both poorer general health and oral health^{10,11}.

The measure of inequality used was medical card ownership; ownership was taken as a surrogate for disadvantage. The proportion of the 12-year-old non disadvantaged group (MC No) with toothwear on at least one anterior tooth was 16.8% (most of which was mild: 16.0%). The prevalence among the disadvantaged group (MC Yes) was 20.2% (mild: 19.2%). In the 15-year-old age group, this had increased to 29.3% (mild: 27.8%) for the non disadvantaged group, and 31.3% (mild: 29.1%) for the disadvantaged group (Table 7.7). Although the percentage of children in both age groups with toothwear was greater among the disadvantaged group, the difference was not statistically significant.

Table 7.7 Percentage according to maximum level of toothwear by age group and medical card status

	Age 12			
	MC Yes		MC No	
	%	n	%	n
Mild	19.2	144	16.0	503
Moderate	0.9	11	0.7	22
Severe	0.1	1	0.1	2
Any Toothwear	20.2	156	16.8	527
	Age 15			
	MC Yes		MC No	
	%	n	%	n
Mild	29.1	256	27.7	698
Moderate	1.7	30	1.3	37
Severe	0.5	4	0.3	4
Any Toothwear	31.3	290	29.3	739

7.6 Questionnaire Analysis

The 15-year-old adolescents were asked to complete a questionnaire (Appendix 7) on oral hygiene practices and dietary habits. Questions relevant to toothwear were those in relation to toothbrushing habits and soft drink consumption. The children were asked to record how often they brushed, how much toothpaste they used, and the method of rinsing they used after brushing. They were also asked to record how often they consumed pure fruit juices, soft drinks, or carbonated water in a day.

7.7 Multivariate Analysis

The demographic and questionnaire variables were analysed, in SAS (version 9.1), using Logistic Regression to determine their effect on the presence or absence of toothwear on the permanent anterior teeth of 15-year-olds in Rol.

The variables and their levels tested for inclusion in the model were as follows:

- Parent's Occupation Class – Highest occupation class level of parents.
- Gender – Male, Female.
- Frequency of toothbrushing (Q1) – Once a day or less, twice a day or more.
- Amount of toothpaste used when brushing (Q2a) – Pea-sized amount of toothpaste, Half toothbrush of toothpaste, Full toothbrush of toothpaste or more.
- Method of rinsing after brushing (Q2b) – Using the toothbrush to rinse, Other method of rinsing (glass, cupping hands, rinsing directly from the tap).
- Frequency of consumption of fruit juice, fizzy drinks, or carbonated water (Q4) – Drinking at least one of them at least once a day, not drinking any of them at least once a day.

Frequency of toothbrushing ($p=0.005$) and method of rinsing after brushing ($p=0.028$) were significant for the presence, or absence, of 'any toothwear' on the permanent anterior teeth of 15-year-olds in Rol. 'Any toothwear' refers to mild, moderate and severe combined.

Of the 3,319 adolescents included in the Logistic Regression model, approximately 32.5% of those who brush once a day or less and 27.7% of those who brush twice a day or more had signs of toothwear on at least one permanent anterior tooth (Table 7.8).

Table 7.8 Percentage according to maximum level of toothwear by frequency of toothbrushing (Once a day or less, Twice a day or more) for 15-year-olds

	Once a day or less		Twice a day or more	
	%	n	%	n
No Toothwear	67.5	954	72.4	1379
Any Toothwear	32.5	459	27.7	527

Approximately 25.8% of those who use a toothbrush to rinse their mouth after brushing and 30.7% of those who rinse their teeth after brushing using a different method (glass, cupping hands, rinsing directly from the tap) had signs of toothwear on at least one permanent anterior tooth (Table 7.9).

Table 7.9 Percentage according to maximum level of toothwear by method of rinsing teeth after brushing (Using a toothbrush to rinse, Using another method of rinsing) for 15-year-olds

	Using a toothbrush to rinse		Other method of rinsing	
	%	n	%	n
No Toothwear	74.2	488	69.3	1845
Any Toothwear	25.8	170	30.7	816

In conclusion, 17.4% of 12-year-olds and 29.7% of 15-year-olds, had toothwear into dentine. These data will be used as a baseline and will facilitate monitoring of population trends of toothwear in the future.

The index used to record toothwear was the same index used in the Oral Health of Irish Adults survey in 2000/02⁴, and in the Adult Dental Health Survey in the United Kingdom⁵. Since the age groups differ between the surveys, direct comparisons are not possible. However, in Rol, toothwear increased from 29.7% in 15-year-olds to 38.1% in the 16- to 24-year-old age group, which were examined in the Adult Survey.

The figures reported in Rol for toothwear on the smooth labial and palatal surfaces are similar to those levels recorded in the Children's Dental Health Survey in the United Kingdom in 2003¹². Among the 12-year-old age group, 3% of children in the United Kingdom (UK) had toothwear into dentine compared with 3.1% in Rol. Of the UK 15-year-old age group, 5% had toothwear into dentine compared with 3.6% in Rol. Again direct comparison is not possible, as although the indices were similar they were not identical.

Strategies are required to ensure that toothwear is maintained within acceptable physiological norms, and does not progress to pathological wear requiring expensive, demanding and recurring remedial treatment. This dataset will assist in establishing toothwear norms for the age groups examined. It may be that toothwear within the mild category can be considered acceptable and will not require restorative care. However, it must be borne in mind that the anterior teeth of 12- and 15-year-old children are expected to remain in function for at least another 60 years. From the report it can be seen that wear of the teeth increases with age.

Fluoride has been recommended to manage the early signs of toothwear, as it promotes remineralisation of the hard tissues, and discourages demineralisation^{13,14}. It is significant that in this national survey, children who brushed more than once a day had less toothwear than those who brushed less frequently. This is similar to the findings of Bardsley et al (2004)⁹. The finding that wear was found less often among those who use a toothbrush to rinse their mouth after brushing than those who rinse after brushing using other methods (i.e. rinse using a glass, cupping hands under tap and rinsing directly from the tap) is consistent with the protective role of fluoride. These latter methods use greater amounts of water and possibly flush more fluoride out of the mouth after brushing. Further research is required to establish whether this is due to the topical effect of fluoride delivered from toothpaste, as 95% of all toothpaste sold in Ireland contains fluoride. The children brushing less frequently were also the children found in the survey to require oral hygiene instruction and plaque and calculus removal.

Although the prevalence of toothwear on the smooth surfaces was low, wear was only recorded when it had progressed to the dentine. Despite previous reported difficulties in recording wear in tooth enamel, an index that would permit recording of changes in enamel should be considered. No attempt has been made to separate out the different types of wear. It is likely that all types of wear are contributory, the dominant type being dependent on the interplay of a number of factors, which will require further research to establish.

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Chapter 8

Sociological Variables and Dental Caries Levels in NI and RoI

8.1 Summary

- In the Republic of Ireland (RoI) in 2002, 89.3% of the parents of 8-year-olds claimed that they would prefer to have an aching back tooth filled compared with 72% in 1984. The corresponding figures for preferences relating to an aching front tooth were 93.1% and 85%.
- In Northern Ireland (NI) in 2002, the percentages choosing filling of an aching back or front tooth were very similar to those in RoI.
- The mean D_{3vc} MFT and the proportion attributed to the filled component, was similar in the groups preferring to have an aching front or back tooth filled, and also in those who opted for extraction.
- Over half of 8-year-olds and approximately two thirds of 15-year-olds in RoI and NI consumed sweet snacks twice a day or more often.
- There has been a substantial increase in the frequency of snacking among 8- and 15-year-olds in RoI since 1984.
- Frequency of tooth brushing was higher in NI than in RoI. However in RoI, the frequency has increased since 1984.
- In NI, 92.0% of 8-year-olds and 91.3% of 15-year-olds reported visiting the dentist at least every 12 months. In RoI, the percentage is much lower at 42.3% for 8-year-olds and 49.8% for 15-year-olds.
- In RoI, 21.4% of 8-year-olds and 17.9% of 15-year-olds had never been to a dentist compared to 1.1% and 2.1% respectively in NI.
- In RoI, 64.4% of parents thought that if their child had a toothache they could get emergency treatment locally. In NI, this figure was greater at 75.7%.
- In RoI, 80.1% of parents said that they had never experienced any problems getting dental treatment for their child, 20.0% reported experiencing some difficulty. The mean D_{3vc} MFT in both groups was similar. There was little difference in the response to this question according to disadvantage status.
- In RoI, 4.3% of parents were either 'dissatisfied' or 'very dissatisfied' with the dental service provided to their children, 36.5% were 'satisfied' and 46.1% were 'very satisfied'. In NI, almost all the parents completing the questionnaire were either 'very satisfied' (69.4%) or 'satisfied' (29.3%) with the service provided. There was little difference in satisfaction levels with the service according to disadvantage status.
- Amongst 8- and 15-year-olds, in RoI and NI, there was a general tendency for the mean D_{3vc} MFT to be higher amongst those within the lower occupational classes (lower paid).
- The following variables were significant for the distribution of primary caries among 8-year-olds in RoI: Fluoridation Status, Parents' Occupational Status, Age at which brushing began, Frequency of brushing, and Frequency of snacking.
- Only one variable - Age at which brushing began, was significant for the distribution of primary caries among 8-year-old children in NI.
- Among 15-year-olds in RoI, the following variables were significant for the distribution of caries (D_{3vc} MFT): Fluoridation status, Parents' Occupational Status, Frequency of brushing, Method of rinsing, and Frequency of snacking.
- The following variables were significant for the distribution of caries (D_{3vc} MFT) among 15-year-old adolescents in NI: Parents' Occupational Status, Age at which brushing began, and Frequency of snacking.

8.2 Introduction

Oral health attitudes and behaviours, and the perceived availability, accessibility, and acceptability of dental services were ascertained from parents of 8-year-olds and from 15-year-olds themselves who completed questionnaires. The design of the questionnaires was similar, but not identical, for both age groups in RoI and NI. The four questionnaires, with weighted percentage results for the respondents as a whole and by disadvantage status (as measured by family ownership of a medical card (MC) in RoI or receipt of low income benefits (LIB) in NI) are presented in Appendix 7.

In this chapter, the results of selected questions are presented first according to age group and then by disadvantage status within age group for RoI and NI. It is well established that levels of health, including oral health, are strongly associated with many sociological variables. With a view to estimating the effects of sociological variables on oral health in RoI and NI, caries levels are presented according to the responses to the questionnaire. In this chapter, caries levels are presented at the dentinal level of involvement (D_{3vc} MFT). Caries levels in the primary canines (c's) first (d's) and second (e's) primary molars are also presented at the dentinal level of involvement (cde d_{3vc} mft) for 8-year-olds. This variable is of interest as it represents the accumulation of caries in primary teeth from approximately age 2 to age 8. Caries levels on the permanent teeth of 8-year-olds are low as in many cases they are relatively newly erupted.

8.3 Attitudes to oral health and mean D_{3vc} MFT

In RoI, in 2002, 89.3% of the parents of 8-year-olds claimed that they would prefer to have an aching back tooth filled compared with 72% in 1984 (Table 8.1). The corresponding figures for preferences relating to an aching front tooth were 93.1% and 85%. In NI in 2002, the percentages choosing filling of an aching back (89.5%) or front (90.9%) tooth were very similar to those in RoI. Amongst 15-year-olds in RoI, the percentage preferring to have an aching back tooth filled was 56.9%, with 76.8% preferring to have an aching front tooth filled. Again, the corresponding percentages in NI are very similar. In the case of 15-year-olds, the question asked in 1984 in relation to treatment choices for aching back and front teeth differed from those asked on this topic in 2002; hence changes in preferences over time for 15-year-olds cannot be estimated.

It is interesting that the choice to fill an aching back or front tooth was higher amongst 8-year-olds, for whom their parents answered the question, than amongst 15-year-olds who completed the questionnaire themselves. No doubt the wishes of parents of 8-year-olds do not necessarily reflect their child's wishes.

The increase between 1984 and 2002, in RoI, in the proportion of parents of 8-year-olds who chose filling instead of extraction of an aching tooth is probably a reflection of the increase in the expectations, knowledge and demands of the public for a more conservative approach to dental problems.

The mean D_{3vc} MFT, and the proportion attributed to the filled component, was similar in the groups preferring to have an aching front or back tooth filled, and also in those who opted for extraction. Among 8-year-olds, the mean cde d_{3vc} mft score was also similar in the groups.

The choice of extraction for both aching front and back teeth was more common amongst the less well off (MC/LIB), i.e. dependents of those with medical cards (MC) or in receipt of low income benefits (LIB), in RoI and NI respectively. For example, 19.3% of 15-year-olds in the disadvantaged group in RoI would opt for extraction of a back tooth, compared with 16.5% in the non disadvantaged group. The pattern was the same in NI where these percentages were 22.1% and 14.0% respectively. These data indicate a need to improve attitudes to tooth retention, especially among the less well off.

Table 8.1 Oral health attitudes and mean D_{3vc} MFT: Preferences for treatment of aching permanent back or front tooth, for 8- and 15-year-olds, by disadvantage, in RoI in 1984 and 2002, and NI in 2002

		Age 8						
		Back tooth						
		Total %	Mean D_{3vc} MFT	FT/ D_{3vc} MFT	Mean cde d_{3vc} mft	ft/cde d_{3vc} mft	MC/LIB Yes %	MC/LIB No %
Fill	RoI 1984	72						
	RoI 2002	89.3	0.4	0.4	2.3	0.2	80.7	91.8
	NI 2002	89.5	0.4	0.4	3.3	0.2	87.1	91.7
Extract	RoI 1984	24						
	RoI 2002	6.1	0.6	0.2	2.4	0.1	12.5	4.3
	NI 2002	4.4	0.9	0.1	4.5	0.0	8.3	1.3

		Age 8							
		Front tooth							
		Total %	Mean D_{3vc} MFT	FT/ D_{3vc} MFT	Mean cde d_{3vc} mft	ft/cde d_{3vc} mft	MC/LIB Yes %	MC/LIB No %	
Fill	RoI 1984	85							
	RoI 2002	93.1	0.4	0.4	2.3	0.2	88.0	94.5	
	NI 2002	90.9	0.5	0.4	3.3	0.2	91.7	90.5	
Extract	RoI 1984	11							
	RoI 2002	1.4	0.7	0.1	2.3	0.2	3.7	0.8	
	NI 2002	3.0	0.6	0.2	5.0	0.2	4.6	1.9	
		Age 15							
		Back tooth							
		Total %	Mean D_{3vc} MFT	FT/ D_{3vc} MFT	MC/LIB Yes %	MC/LIB No %			
Fill	RoI 1984	56							
	RoI 2002	56.9	3.1		0.6	58.3	56.9		
	NI 2002	59.4	4.3		0.7	61.1	58.5		
Extract	RoI 1984	44							
	RoI 2002	17.3	2.8		0.6	19.3	16.5		
	NI 2002	16.4	4.2		0.6	22.1	14.0		
		Front tooth							
		Fill	RoI 1984	86					
			RoI 2002	76.8	2.9		0.6	76.6	77.0
NI 2002	79.1		4.2		0.7	77.8	79.6		
Extract	RoI 1984	14							
	RoI 2002	5.1	3.1		0.6	6.4	4.6		
	NI 2002	5.6	4.1		0.6	7.3	5.0		

8.4 Oral health behaviour and mean D_{3vc} MFT

8.4.1 Snacking habits and mean D_{3vc} MFT

A number of questions were asked on oral health behaviour including 'how often does your child ('do you' in the case of 15-year-olds) consume sweet food or sweet drinks such as Coca-Cola, Pepsi-Cola, 7-up, Ribena, fruit drinks, etc between normal meals?' (Table 8.2). Amongst 8-year-olds, in 2002, 45.7% of the parents claimed that their child consumed sweet snacks between meals 'never/once a day', 47.3% claimed that their child consumed sweet snacks '2-3 times a day', and 7.0% claimed their child consumed snacks '4 or more times a day'. The corresponding percentages for NI were very similar. The same question was asked of parents of 8-year-olds in RoI in 1984; a slight change in snacking habits is evident, with an increase in the percentage claiming that their child had sweet snacks between meals 2-3 times a day or more often, and a slight decrease in the percentage replying 'never/once a day', from 52% to 45.7%. In 2002, the snacking habits of 15-year-olds in RoI and NI were very similar. For 15-year-olds, as with 8-year-olds, there is a change in reported snacking habits in RoI between 1984 and 2002, with a substantial increase in those claiming to have sweet snacks between meals 2-3 times a day or more often.

Among 8-year-olds in RoI, mean D_{3vc} MFT was similar for the groups whose parents gave the different answers to the questions about snacking. In NI, the mean D_{3vc} MFT was also similar in the three groups. For 8-year-olds in RoI and NI, cde d_{3vc} mft increased as frequency of snacking increased. Among 15-year-olds in RoI, the mean D_{3vc} MFT was substantially higher. For example, mean D_{3vc} MFT was 3.4 among the 12.6% who claimed that they consumed sweet snacks between meals '4 or more times a day'. For 15-year-olds, both in RoI and NI, caries levels were higher amongst those with more frequent snacking habits.

Frequency of snacking did not vary much according to disadvantage among 8-year-olds in Rol. In NI, 49.1% of the non disadvantaged group consumed snacks 'never/once a day' compared to 36.1% of the disadvantaged group (Table 8.2). Accordingly, consumption of snacks '2-3 times a day' was more common among the less well off 8-year-olds in NI. Among 15-year-olds in Rol, frequency of consumption of snacks '4 or more times a day' was more common among the less well off (17.4% vs. 11.2%). The pattern was the opposite in NI, with a higher percentage of the non disadvantaged consuming snacks '2-3 times a day' (53.6% vs. 47.7%).

Table 8.2 Oral health behaviour and mean D_{3vc} MFT: Frequency of sweet snacks between meals for 8- and 15-year-olds, by disadvantage, in Rol in 1984 and 2002, and NI in 2002

	Age 8										
	Rol 1984 (n = 1123)	Rol 2002 (n = 3645)					NI 2002 (n = 298)				
	%	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	LIB Yes %	LIB No %
Never/once a day	52	45.7	0.4	2.0	45.7	45.8	43.3	0.4	2.7	36.1	49.1
2-3 times a day	38	47.3	0.4	2.4	46.4	47.6	48.0	0.5	3.6	54.9	42.8
4 or more times a day	6	7.0	0.5	2.8	7.9	6.7	8.7	0.6	5.2	9.0	8.2
	Age 15										
	Rol 1984 (n = 1036)	Rol 2002 (n = 3034)					NI 2002 (n = 547)				
	%	Total %	Mean D_{3vc} MFT	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	LIB Yes %	LIB No %		
Never/once a day	35	36.4	2.5	32.0	37.6	33.8	3.3	36.6	30.6		
2-3 times a day	43	51.1	2.8	50.7	51.2	50.6	4.1	47.7	53.6		
4 or more times a day	8	12.6	3.4	17.4	11.2	15.5	4.8	15.7	15.8		

8.4.2 Tooth brushing habits and mean D_{3vc} MFT

In Rol in 2002, 58.2% of the parents of 8-year-olds claimed that their child brushed his/her teeth '2 times a day or more' (Table 8.3a). In NI, the corresponding percentage was higher at 65.6%. In Rol in 1984, 47% of the parents claimed their child brushed their teeth '2 times a day or more'.

Among 15-year-olds in Rol, similar trends are apparent, with a higher percentage claiming to brush their teeth '2 times a day or more' in 2002 (57.6%) when compared with 1984 (50%). There was also a higher percentage brushing '2 times a day or more' in NI in 2002, when compared with the corresponding percentage in Rol in 2002.

Among 8-year-olds in Rol, mean cde d_{3vc} mft increased as frequency of brushing decreased. Among 15-year-olds in 2002, both in Rol and NI, there was a tendency for the mean D_{3vc} MFT to be higher amongst those children who claimed that they brushed their teeth 'less than once a day', when compared with those who claimed to brush their teeth '2 times a day or more'.

The proportion of 8- and 15-year-olds that claimed to brush their teeth '2 times a day or more' was consistently higher amongst the non disadvantaged group (no MC/LIB) in Rol and NI. The difference was particularly marked among 8-year-olds in NI, where 73.6% of parents of the non disadvantaged group claimed their children's teeth were brushed '2 times a day or more', compared with 55.2% of the disadvantaged group.

Table 8.3a Oral health behaviour and mean D_{3vc} MFT: Frequency of tooth brushing for 8- and 15-year-olds, by disadvantage, in Rol in 1984 and 2002, and NI in 2002

	Age 8										
	Rol 1984 (n = 1086)		Rol 2002 (n = 3684)				NI 2002 (n = 299)				
	%	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	LIB Yes %	LIB No %
2 times a day or more	47	58.2	0.4	2.1	52.4	59.8	65.6	0.4	3.1	55.2	73.6
Once a day	43	34.4	0.5	2.4	35.2	34.5	27.4	0.7	4.1	33.6	22.6
Less than once a day	10	7.5	0.5	2.6	12.4	5.8	7.0	0.4	3.1	11.2	3.8
	Age 15										
	Rol 1984 (n = 1182)		Rol 2002 (n = 3473)				NI 2002 (n = 624)				
	%	Total %	Mean D_{3vc} MFT	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	LIB Yes %	LIB No %		
2 times a day or more	50	57.6	2.6	51.6	60.3	64.3	3.8	60.8	66.5		
Once a day	34	33.1	2.9	36.8	31.3	30.0	4.4	33.5	27.8		
Less than once a day	15	9.4	3.5	11.6	8.4	5.8	6.0	5.7	5.8		

The Forum on Fluoridation¹ report recommended that children use only a pea-sized amount of toothpaste to brush their teeth up to age seven. This recommendation is also made by toothpaste manufacturers. The rationale for this advice is to avoid swallowing of excess fluoride by young children, which could cause fluorosis in the developing permanent dentition. The children examined in this survey were approximately eight years old and were unlikely to have changed their toothpaste usage habits in the twelve months before the survey. In Rol, 42.4% of parents of 8-year-olds said that their children used a pea-sized amount of toothpaste to brush their teeth (Table 8.3b), 42.3% used a half brush head and 14.4% used more than this amount. The pattern was very similar for 8-year-olds in NI. Wider dissemination and advertising of the Forum's recommendation would be one way to inform the public about the importance of using a pea-sized amount of toothpaste when brushing up to age seven. The percentage of 15-year-olds using a pea-sized amount was much lower in NI than in Rol

(at 5.6% and 14.7% respectively), with the vast majority using more than this amount. The most common amount of toothpaste used by 15-year-olds was half a brush of toothpaste in Rol and a full brush of toothpaste in NI.

There appears to be no relationship between caries levels and amount of toothpaste used in any of the groups.

Among 8-year-olds in Rol, there was a slight tendency for a higher percentage of non disadvantaged groups (MC No) to use a pea-sized amount of toothpaste; the opposite is the case in NI. Among 15-year-olds in NI, the disadvantaged group used more toothpaste than the non disadvantaged group as measured by the percentage using a full brush head of toothpaste (62.2% vs. 51.7%).

Table 8.3b Oral health behaviour and mean D_{3vc} MFT: Amount of toothpaste used, by disadvantage for 8- and 15- year-olds, in Rol and NI

	Age 8									
	Rol (n = 3679)					NI (n = 299)				
	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	LIB Yes %	LIB No %
My child's teeth are not usually brushed	0.9	0.5	3.0	2.0	0.5	0.7	0.0	1.0	1.5	0.0
My child does not use toothpaste	0.4	0.3	2.6	0.7	0.4	0.7	0.5	2.5	0.8	0.6
Pea-sized amount of toothpaste	42.4	0.4	2.1	36.7	44.1	39.1	0.5	3.7	41.0	38.4
Half brush of toothpaste	42.3	0.4	2.2	42.2	42.1	42.8	0.3	2.9	36.6	47.2
Full brush of toothpaste	13.3	0.5	2.6	17.5	12.4	16.4	0.6	3.6	19.4	13.8
Overflowing brush of toothpaste	1.1	0.4	2.8	1.5	1.0	0.3	1.0	8.0	0.8	0.0
	Age 15									
	Rol (n = 3493)					NI (n = 626)				
	Total %	Mean D_{3vc} MFT	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	LIB Yes %	LIB No %		
I do not brush my teeth	2.4	2.9	3.2	2.2	1.4	3.2	1.4	1.2		
I brush but I do not use toothpaste	0.3	6.4	1.0	0.2	0.2	6.0	0.0	0.3		
Pea-sized amount of toothpaste	14.7	2.8	11.4	15.6	5.6	2.6	4.8	6.2		
Half brush of toothpaste	42.3	2.7	40.9	43.0	33.9	4.2	26.3	37.1		
Full brush of toothpaste	37.9	3.0	40.7	36.6	55.0	4.2	62.2	51.7		
Overflowing brush of toothpaste	2.5	3.3	3.2	2.4	4.0	3.1	5.3	3.5		

8.4.3 Frequency of visits to the dentist and mean D_{3vc} MFT

Visiting the dentist 'every 6-12 months' was the most common response to the question regarding dental visiting patterns, with slightly less than a third of 8-year-olds (27.8%) and 15-year-olds (30.4%) in Rol being in this category (Table 8.4). In NI, the corresponding percentages were 43.6% and 38.9% for 8- and 15-year-olds respectively. A surprisingly high percentage of 8-year-olds (21.4%) and 15-year-olds (17.9%) in Rol had 'never been to a dentist'. The considerably lower proportion of 8- and 15-year-olds in NI who had never been to the dentist (1.1% and 2.1% respectively) is most likely to be due to the different system of delivery of dental care to these age groups in NI, where they are seen and treated in general dental practice. The system in NI encourages early registration of children with their dentist.

Among 8- and 15-year-olds, in Rol and NI, there was no apparent trend in the relationship between the frequency of visiting the dentist and the mean D_{3vc} MFT. This is also the case for the mean cde d_{3vc} mft score in 8-year-olds.

In both age groups, in both jurisdictions, dental visiting was less frequent among the less well off. For example, among 8-year-olds in Rol, 19.7% of the non disadvantaged group had never been to the

dentist, compared to 27.5% of the disadvantaged group. In NI, where the pattern of dental visiting was considerably more frequent than in RoI, 53.9% of the non disadvantaged group visited the dentist every six months or more often, compared with 42.4% of the disadvantaged group. In RoI, these figures are 14.7% and 13.8% respectively.

Table 8.4 Oral health behaviour and mean D_{3vc} MFT: Visits to the dentist for 8- and 15-year-olds, by disadvantage, in RoI and NI

	Age 8									
	RoI (n = 2567)					NI (n = 287)				
	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	LIB Yes %	LIB No %
Every 6 months or more often	14.5	0.5	2.5	13.8	14.7	48.4	0.5	3.5	42.4	53.9
Every 6-12 months	27.8	0.4	2.4	26.4	28.0	43.6	0.4	3.0	46.4	41.7
Every 12-24 months	21.8	0.5	2.5	17.0	23.1	5.6	0.5	2.7	6.4	3.9
Every 2 years/more	14.5	0.4	2.1	15.4	14.6	1.4	1.0	4.3	3.2	0.0
Never been to a dentist	21.4	0.3	1.5	27.5	19.7	1.1	0.0	0.7	1.6	0.6
	Age 15									
	RoI (n = 2656)					NI (n = 578)				
	Total %	Mean D_{3vc} MFT	MC Yes %	MC No %	Total %	Mean D_{3vc} MFT	LIB Yes %	LIB No %		
Every 6 months or more often	19.4	2.7	13.6	21.4	52.4	3.9	44.0	56.9		
Every 6-12 months	30.4	2.7	27.9	31.2	38.9	4.1	44.5	35.8		
Every 12-24 months	18.9	3.0	18.2	18.8	4.8	4.3	5.5	4.4		
Every 2 years/more	13.5	2.4	16.9	12.5	1.7	3.7	2.2	1.6		
Never been to a dentist	17.9	2.8	23.4	16.2	2.1	4.3	3.9	1.3		

8.5 Accessibility of dental services and mean D_{3vc} MFT

8.5.1 Perceived accessibility of emergency care

The parents of 8-year-old children were asked 'If your child had a toothache today could you get emergency treatment locally?' (Table 8.5). In RoI, the percentage replying 'Yes' was 64.4%, 10.4% claimed 'No' and 25.2% did not know. In NI, 75.7% of parents claimed that if their child had a toothache they could get emergency treatment locally, 7.1% replied that they could not get such treatment locally, and 17.2% replied that they did not know. This question was not asked of 15-year-olds.

There was no relationship between perceived accessibility of dental services and mean D_{3vc} MFT or mean cde d_{3vc} mft.

There was no significant difference in perceived accessibility of local dental care between the disadvantaged and non disadvantaged groups in NI. However, perceived access to local care was greater among the non disadvantaged group in RoI. Altogether, 66.5% of the non disadvantaged group perceived that they could get emergency care locally for their child compared with 57.6% of the disadvantaged group in RoI.

Table 8.5 8-year-olds: Accessibility of dental services in Rol and NI. 'If your child had a toothache today could you get emergency treatment locally?'

	Rol (n = 3669)					NI (n = 296)				
	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	MC Yes %	MC No %	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	LIB Yes %	LIB No %
Yes	64.4	0.4	2.3	57.6	66.5	75.7	0.4	3.4	76.5	75.3
No	10.4	0.5	2.8	14.8	9.1	7.1	0.5	2.5	7.6	6.3
Don't Know	25.2	0.4	2.0	27.6	24.4	17.2	0.4	3.4	15.9	18.4

8.5.2 Waiting time for a dental appointment in a health board clinic for relief of pain and mean D_{3vc} MFT

Approximately one third of the parents of 8-year-olds in Rol replied that they would expect to be seen on the 'same day' that they sought an appointment with the health board (school) dentist for the relief of pain (Table 8.6). Over a third of the parents claimed they did not know how long they would have to wait in this situation, with the remainder more or less equally divided between the 'following day', 'less than three days' and 'more than three days'. As the system of delivery of dental care is different in NI, this question was not asked there, and it was also not asked of 15-year-olds.

The mean D_{3vc} MFT score ranged from 0.3 in the group that did not know how long they would have to wait, to 0.5 in the groups who replied the 'same day' and the 'following day'. The mean cde d_{3vc} mft score ranged from 1.8, for those who did not know how long they would have to wait, to 2.8 for those who replied the 'following day'.

Compared to the non disadvantaged group, a higher proportion of the disadvantaged in Rol (27.7% vs. 37.8%) felt they could get an immediate appointment with a health board dentist for emergency relief of pain for their child.

Table 8.6 8-year-olds: 'If you want to bring your child to the health board (school) dentist, how long do you think you'll have to wait for an appointment for relief of pain?' by medical card status

	Rol (n = 3669)				
	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	MC Yes %	MC No %
Same day	29.7	0.5	2.6	37.8	27.7
Following day	13.6	0.5	2.8	14.0	13.3
Less than three days	11.3	0.4	2.6	9.5	11.5
More than three days	9.2	0.4	2.3	9.7	9.1
Don't know	36.2	0.3	1.8	29.0	38.4

8.5.3 Waiting time for a dental appointment in a health board clinic for routine treatment and mean D_{3vc} MFT

About a quarter (24.9%) of the parents of 8-year-olds in Rol did not know how long they thought they might have to wait for an appointment with a health board (school) dentist for routine treatment (Table 8.7). The percentages who thought they would have to wait for 'less than one week', 'less than one month', 'less than six months', and 'six months or more' were 11.7%, 27.6%, 13.4% and 7.9% respectively. Approximately 14.6% claimed that their child would not receive treatment unless he/she was called in for treatment to the health board system.

The mean D_{3vc} MFT score amongst the different groupings were similar. The mean cde d_{3vc} mft score ranged from 1.8, for those whose parents did not know how long they would have to wait for an appointment, to 2.6 for those whose parents responded 'less than one week' and 'less than one month'.

More of the disadvantaged group thought that they would be able to get an appointment within one week (17.8%) than the non disadvantaged group (10.3%).

Table 8.7 8-year-olds: 'If you want to bring your child to the health board (school) dentist how long do you think you'll have to wait for an appointment for routine dental treatment (e.g. permanent fillings)?'

	Rol (n = 3661)				
	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MCYes %	MC No %
Less than one week	11.7	0.5	2.6	17.8	10.3
Less than one month	27.6	0.5	2.6	28.2	27.2
Less than six months	13.4	0.4	2.1	12.8	13.4
Six months or more	7.9	0.5	2.1	4.9	8.7
My child would not receive routine treatment unless HB called in	14.6	0.4	2.3	14.5	14.8
Don't know	24.9	0.3	1.8	21.9	25.7

8.5.4 Experience of problems getting dental treatment and mean D_{3vc} MFT

Of the 3,776 parents of 8-year-olds in Rol who answered the question 'have you ever experienced any problems getting dental treatment for your child?' 80.1% answered 'No', and the remaining 20.0% answered 'Yes' (Table 8.8).

The mean D_{3vc} MFT score in the groups was similar. The mean cde d_{3vc} mft score was 2.5 for children whose parents answered 'Yes' to the question and 2.2 for those whose parents answered 'No'. There was little difference in the response to this question according to disadvantage status.

Of those who answered 'Yes' to this question, a total of 79.9% claimed that they 'did not know what treatment my child is entitled to or where to access that treatment' or 'my child has not been contacted by the health board (school) dentist for treatment'.

Table 8.8 8-year-olds: 'Have you ever experienced any problems getting dental treatment for your child?'

	Rol (n = 3776)				
	Total %	Mean D_{3vc} MFT	Mean cde d_{3vc} mft	MCYes %	MC No %
Yes	20.0	0.5	2.5	22.3	19.3
No	80.1	0.4	2.2	77.7	80.7

8.6 Acceptability of dental services and mean D_{3vc} MFT

A total of 3,624 parents of 8-year-olds in Rol replied to the question regarding satisfaction with the services provided for the child (Table 8.9). Of these, 4.3% were either 'dissatisfied' or 'very dissatisfied' with the service provided. Almost all of the remainder were 'satisfied' (36.5%) or 'very satisfied' (46.1%). In NI, almost all the parents who completed the questionnaire were either 'very satisfied' (69.4%) or 'satisfied' (29.3%) with the service provided. There was no clear trend in the relationship between satisfaction with the services provided and mean D_{3vc} MFT or mean cde d_{3vc} mft. There was little difference in satisfaction levels with the service according to disadvantage status.

Table 8.9 8-year-olds: 'Were you satisfied with the service your child received last?'

	Rol (n = 3624)					NI (n = 297)				
	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	MC Yes %	MC No %	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	LIB Yes %	LIB No %
Very satisfied	46.1	0.4	2.3	39.3	47.9	69.4	0.4	3.2	67.4	71.1
Satisfied	36.5	0.5	2.4	39.2	36.0	29.3	0.5	3.7	30.3	28.3
No opinion/Doesn't concern me	0.4	0.2	2.8	0.4	0.4	0.3	0.0	0.0	0.8	0.0
Dissatisfied	3.4	0.5	2.6	3.2	3.5	0.3	0.0	5.0	0.8	0.0
Very dissatisfied	0.9	0.6	3.2	1.4	0.7					
My child has never been to a dentist	13.0	0.3	1.4	16.9	11.8	0.7	0.0	0.0	0.8	0.6

8.7 Occupational class and mean D_{3vc} MFT

The occupation code of parents was recorded as part of the demographic information collected. When the occupation code differed between the two parents, the lower numbered code (highest class) was allocated. As would be expected with a representative random sample, the percentage distribution in the different occupation code groupings was similar amongst 8-year-olds and 15-year-olds (Table 8.10).

Amongst 8- and 15-year-olds in Rol and NI, there was a general tendency for the mean D_{3vc} MFT to be higher amongst those with the lower occupational classes (lower paid). For example, the mean D_{3vc} MFT for 15-year-old dependents of Managers, Administrators and Professionals on the one hand, and those in the 'Other and Unemployed' categories on the other hand, was 2.5 and 3.1 respectively in Rol, and 3.2 and 5.5 respectively in NI. Among 8-year-olds in Rol, the mean cde d_{3vc} mft score ranged from 1.9 for those whose parents were in the 'Managers, Administrators and Professionals' category, to 2.7 for children whose parents were in the 'Craft and Related' category. In NI, the range was from 2.5 for dependents of Managers, Administrators and Professionals, to 4.1 for those whose parents are in the 'Other and Unemployed' categories.

As MC ownership and receipt of LIB are means tested, it would be expected that the percentage of those in the MC or LIB groups would be higher in lower paid occupations. This was the trend in the groups; for example in the 8-year-old group in Rol, 12.5% of medical card holders were in the higher occupational classes (Managers, Administrators and Professionals), compared with 36.4% of non medical card holders. The figures were comparable in the 15-year-old group in Rol. In NI, the distribution was similar for 8-year-olds. In the case of 15-year-olds, 7.5% of those in the LIB group had parents with occupations classed as 'Managers, Administrators and Professionals', compared with 46.4% of those in the no LIB (better off) group.

Table 8.10 8- and 15-year-olds: Occupation Code of Parents in Rol and NI

	Age 8									
	Rol (n = 3561)					NI (n = 285)				
	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	MC Yes %	MC No %	Total %	Mean D _{3vc} MFT	Mean cde d _{3vc} mft	LIB Yes %	LIB No %
Managers, Administrators and Professionals	31.0	0.3	1.9	12.5	36.4	26.7	0.3	2.5	9.5	40.0
Associate Professional and Technical, Clerical and Secretarial	21.7	0.3	2.0	11.8	24.6	21.8	0.4	3.2	7.9	33.6
Craft and Related	21.0	0.5	2.7	19.5	21.1	17.9	0.4	3.4	24.4	12.3
Personal and Protective Service, Sales, Plant and Machine Operatives	11.8	0.6	2.6	16.3	10.6	10.9	0.3	3.7	11.8	10.3
Other, Unemployed	14.5	0.6	2.4	40.0	7.4	22.8	0.8	4.1	46.5	3.9

	Age 15							
	RoI (n = 3429)				NI (n = 604)			
	Total %	Mean D _{3vc} MFT	MC Yes %	MC No %	Total %	Mean D _{3vc} MFT	LIB Yes %	LIB No %
Managers, Administrators and Professionals	29.0	2.5	12.3	34.7	33.3	3.2	7.5	46.4
Associate Professional and Technical, Clerical and Secretarial	20.2	2.6	11.9	23.3	18.7	3.4	9.5	23.7
Craft and Related	23.0	2.9	25.5	21.5	18.5	4.5	24.4	15.1
Personal and Protective Service, Sales, Plant and Machine Operatives	12.3	3.2	13.7	12.3	11.4	4.6	13.4	10.2
Other, Unemployed	15.5	3.1	36.7	8.2	18.1	5.5	45.3	4.6

8.8 Multivariate Analysis

Demographic and questionnaire variables were analysed in SAS (version 9.1) using Generalised Linear Modelling (GLM) to determine their effect on the distribution of caries. For 8-year-old children, it was decided to use the distribution of caries on primary teeth as the outcome of interest because of the low prevalence of caries on the permanent teeth at this age. Caries scoring was confined to caries on primary canines (c) and first and second primary molars (d,e), as many primary incisors would have exfoliated by age 8. This caries is referred to here as cde caries, and it includes cavitated and non cavitated visible dentine caries at the d_{3vc} level (cde d_{3vc} mft).

Table 8.11 presents the mean and standard deviation of cde d_{3vc} mft for 8-year-old children in RoI and NI by disadvantage and fluoridation status. These data have not been presented in the earlier chapters as the focus was on the condition of the permanent teeth for 8-year-olds. The mean cde d_{3vc} mft is lowest among 8-year-olds residing in fully fluoridated areas in RoI (mean = 1.9), while the mean scores for those residing in non fluoridated areas of RoI and non fluoridated areas of NI are equal (mean = 3.2).

In all three areas, cde d_{3vc} mft levels were lower amongst the non disadvantaged groups (No MC/LIB), with means of 1.8, 3.1 and 2.9 for those residing in fully fluoridated areas of RoI, non fluoridated areas of RoI and non fluoridated areas of NI respectively. The corresponding values for the disadvantaged groups are 2.2, 3.6 and 3.6.

Table 8.11 Mean cde d_{3vc} mft and standard deviations for 8-year-old children in RoI and NI by disadvantage and fluoridation status

	RoI Full FI		RoI Non FI		NI Non FI	
	cde d _{3vc} mft	sd	cde d _{3vc} mft	sd	cde d _{3vc} mft	sd
MC/LIB	2.2	2.6	3.6	2.9	3.6	3.0
No MC/LIB	1.8	2.2	3.1	2.8	2.9	2.9
Total	1.9	2.3	3.2	2.7	3.2	3.0

In the case of 15-year-old adolescents, caries is included in the generalised linear models at the cavitated and non cavitated visible dentine caries level D_{3vc} MFT. Caries in permanent teeth of 15-year-olds has already been described in Chapter 2. Generalised linear models are presented for 8- and 15-year-olds in RoI and NI, as both clinical and questionnaire data were available for these two age groups.

8.8.1 GLM for cde caries for 8-year-olds in RoI and NI

The variables and their levels tested for inclusion in the model for the distribution of cde caries (including the visual component) among 8-year-old children in RoI and NI were as follows:

- Fluoridation status (RoI only) – Non Fluoridated, Full Fluoridated.
- Parent's Occupation Class – Highest occupation class level of parents.
- Gender – Male, Female.
- Body Mass Index (BMI) – Normal, Overweight, Obese.
- Age brushing began (Q1) - Before 12 months of age, After 12 months of age.
- Frequency of brushing (Q2) – Once a day or less, Two times a day or more.
- Amount of toothpaste used when brushing (Q3a) – Pea-sized amount of toothpaste, Half a brush head of toothpaste or more.
- Method of rinsing after brushing (Q3b) – Child uses a glass to rinse, Other method.
- Frequency of snacking (Q4) – Twice a day or less, Three times a day or more.

8.8.1.1 Republic of Ireland

The following variables were significant for the distribution of cde caries (including the visual component) among 8-year-old children in RoI.

Fluoridation Status - ($p < 0.0001$)

Caries levels (cde caries) were lower among those 8-year-old children who reside in fully fluoridated areas of RoI (mean = 1.9) compared to those who reside in non fluoridated areas of RoI (mean = 3.2).

Parents' Occupational Status - ($p = 0.0001$)

The children were grouped by the highest occupation code of their parents as follows:

Code 1 (Managers and Administrators) and Code 2 (Professional Occupations): mean = 1.9

Code 3 (Associate Professional and Technical Occupations) and Code 4 (Clerical and Secretarial Occupations): mean = 2.3

Code 5 (Craft and Related Occupations): mean = 2.9

Code 6 (Personal and Protective Services), Code 7 (Sales Occupation) and Code 8 (Plant and Machine Operatives): mean = 2.3

Code 9 (Other Occupation) and Unemployed: mean = 2.3

Medical card status could be substituted in the model for parents' occupation status as a surrogate for disadvantage ($p = 0.0002$) with cde caries levels being higher among those whose parents are medical card holders (mean = 2.6) than those whose parents are not medical card holders (mean = 2.2)

Age brushing began (Q1) – ($p < 0.0001$)

Caries levels (cde caries) were lower for those 8-year-old children whose teeth were first brushed from before the age of 12 months (mean = 1.8) compared to those whose teeth were first brushed from after the age of 12 months (mean = 2.5).

Frequency of brushing (Q2) – ($p = 0.0355$)

Caries levels (cde caries) were lower for those 8-year-old children whose teeth were brushed twice a day or more (mean = 2.1) compared to those whose teeth were brushed once a day or less (mean = 2.5).

Frequency of snacking (Q4) – ($p = 0.0006$)

Caries levels (cde caries) were lower for those 8-year-old children who consume sweet foods or drinks twice a day or less (mean = 2.2) compared to those who consume sweet foods or drinks three times or more a day (mean = 2.7).

Interaction terms between variables were also tested for inclusion in the model but were not significant.

8.8.1.2 Northern Ireland

Only one variable was significant for the distribution of cde caries (including the visual component) among 8-year-old children in NI:

Age began brushing (Q1) – ($p = 0.039$)

Caries levels (cde caries) were lower for those 8-year-old children in NI whose teeth were first brushed from before the age of 12 months (mean = 2.9) compared to those whose teeth were first brushed from after the age of 12 months (mean = 3.8).

Interaction terms were also tested for inclusion in the model, but were not significant.

The sample size for 8-year-olds was considerably smaller in NI than in Rol, thus the NI sample had considerably less power to show statistically significant differences in caries levels according to sociological variables.

8.8.2 GLM for D_{3vc} MFT for 15-year-olds in Rol and NI

The variables tested for inclusion in the model for the distribution of caries (D_{3vc} MFT) among 15-year-old adolescents in Rol and NI were as follows:

- Fluoridation status (Rol only) – Non Fluoridated, Full Fluoridated.
- Parent's Occupation Class – Highest occupation class level of parents.
- Gender – Male, Female.
- Body Mass Index (BMI) – Normal, Overweight, Obese.
- Frequency of brushing (Q1) – Once a day or less, Two times a day or more.
- Amount of toothpaste used when brushing (Q2a) – Pea-sized amount of toothpaste, Half a brush head of toothpaste or more.
- Method of rinsing after brushing (Q2b) – Child uses a glass to rinse, Other method.
- Frequency of snacking (Q3) – Twice a day or less, Three times a day or more.

8.8.2.1 Republic of Ireland

The following variables were significant for the distribution of caries (D_{3vc} MFT) among 15-year-old adolescents in Rol:

Fluoridation status - ($p < 0.0001$)

Caries levels (D_{3vc} MFT) were lower among those 15-year-old adolescents who reside in fully fluoridated areas of Rol (mean = 2.6) compared to those who reside in non fluoridated areas of Rol (mean = 3.5).

Parents' Occupational Status - ($p = 0.0002$)

The children were grouped by the highest occupation code of their parents as follows:

Code 1 (Managers and Administrators) and Code 2 (Professional Occupations): mean = 2.5

Code 3 (Associate Professional and Technical Occupations) and Code 4 (Clerical and Secretarial Occupations): mean = 2.4

Code 5 (Craft and Related Occupations): mean = 3.0

Code 6 (Personal and Protective Services), Code 7 (Sales Occupation) and Code 8 (Plant and Machine Operatives): mean = 3.2

Code 9 (Other Occupation) and Unemployed: mean = 3.4

Medical card status could be substituted in the model for parents' occupation status as a surrogate for disadvantage ($p=0.01$), with caries levels (D_{3vc} MFT) being higher among those whose parents are medical card holders (mean = 3.2) than those whose parents are not medical card holders (mean = 2.7).

Frequency of brushing (Q1) – (p=0.0068)

Caries levels (D_{3vc} MFT) were lower for those 15-year-old adolescents who brush their teeth two times a day or more (mean = 2.6) compared to those who brush their teeth once a day or less (mean = 3.1).

Method of rinsing (Q2b) – (p=0.006)

Caries levels (D_{3vc} MFT) were higher for those 15-year-old adolescents who use a glass to rinse their teeth after brushing (mean = 3.2) compared to those who use some other method of rinsing (mean = 2.7).

Frequency of snacking (Q3) – (p<0.0001)

Caries levels (D_{3vc} MFT) were lower for those 15-year-old adolescents who consume sweet foods or drinks twice a day or less (mean = 2.6) compared to those who consume sweet foods or drinks three times a day or more (mean = 3.2).

Interaction terms between variables were also tested for inclusion in the model but were not significant.

8.8.2.2 Northern Ireland

The following variables were significant for the distribution of caries (D_{3vc} MFT) among 15-year-old adolescents in NI:

Parents' Occupational Status - (p=0.006)

The children were grouped by the highest occupation code of their parents as follows:

Code 1 (Managers and Administrators) and Code 2 (Professional Occupations): mean = 3.1

Code 3 (Associate Professional and technical Occupations) and Code 4 (Clerical and Secretarial Occupations): mean = 3.4

Code 5 (Craft and Related Occupations): mean = 4.7

Code 6 (Personal and Protective Services), Code 7 (Sales Occupation) and Code 8 (Plant and Machine Operatives): mean = 4.4

Code 9 (Other Occupation) and Unemployed: mean = 5.1

Receipt of low income benefits (LIB) could be substituted in the model for parents occupation status as a surrogate for disadvantage ($p<0.0001$). Caries levels (D_{3vc} MFT) are higher among those whose parents are in receipt of low income benefits (LIB) (mean = 5.0) than those whose parents are not in receipt of low income benefits (mean = 3.5).

Frequency of brushing (Q1) – (p=0.0341)

Caries levels (D_{3vc} MFT) were higher for those 15-year-old adolescents who brush once a day or less (mean = 4.5) compared to those who brush twice a day or more (mean = 3.6).

Frequency of snacking (Q4) – (p=0.0052)

Caries levels (D_{3vc} MFT) were lower for those 15-year-old adolescents who snack twice a day or less (mean = 3.6) than those who snack three times a day or more (mean = 4.5).

Again, interaction terms were also tested for inclusion in the model, but were not significant.

As with 8-year-olds, the sample size for 15-year-olds was smaller in NI than RoI, and thus had less power to detect differences in the distribution of caries scores according to the sociological variables included in the model.

REFERENCES:

- 1 Department of Health and Children (2002) Forum on Fluoridation 2002. Stationery Office, Dublin, 2002.

Appendices

Appendix 1 Project group - University College Cork

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Northern Area Health Board

South West Area Health Board

Midland Health Board

Mid Western Health Board

North Eastern Health Board

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Appendix 5b) List of Photographers and Time Keepers

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Ms. Phillipa Heron
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Trainers

Appendix 6a) Direct Data Entry Software

Developer: JacSoftware Ltd, The Old Barracks, Watergrasshill, Co. Cork Manual compiled and training provided by Dr. Evelyn Crowley, University College Cork

Appendix 6b) Random Number Generator Software

Developer: Stephen Spelman Engineering Ltd., Bohillane, Ladysbridge, Co. Cork
Manual compiled and training provided by Dr. Evelyn Crowley, University College Cork

Appendix 7 Questionnaires with weighted percentage response rates

1. Questions and responses as completed by parents, according to family medical card status, for 8-year-old children in ROI
2. Questions and responses as completed by parents, according to by family receipt of low income benefits, for 8-year-old children in NI
3. Questions and responses as completed by 15-year-olds themselves, according to family medical card status.
4. Questions and responses as completed by 15-year-olds themselves, according to family receipt of low income benefits.

Republic of Ireland Questionnaire for Parents of 2nd Class Children

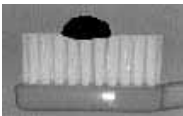

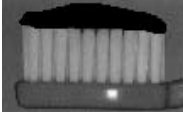

Q1. At what age did you or your child start brushing your child's teeth?

		NO MC (%)	MC (%)	Total (%)
My child's teeth are not usually brushed	1	0.6	2.8	1.1
Before 12 months of age	2	28.3	21.9	26.7
Between 12 and 18 months of age	3	39.1	38.3	39.0
Between 19 and 24 months of age	4	16.6	16.0	16.4
After 24 months of age	5	15.4	20.9	16.8
Total		100.0	100.0	100.0





Q2. How often does your child brush his/her teeth (or have them brushed for him/her)?

		NO MC (%)	MC (%)	Total (%)
My child's teeth are not usually brushed	1	0.4	1.7	0.8
Less than once a day (e.g., every second day, once a week)	2	5.4	10.7	6.7
Once a day	3	34.5	35.2	34.4
Twice a day	4	58.3	49.9	56.5
More than twice a day	5	1.5	2.5	1.7
Total		100.0	100.0	100.0

Q3a. These pictures show different amounts of toothpaste on a brush. Which picture shows the amount of toothpaste your child uses?

		NO MC (%)	MC (%)	Total (%)
	My child's teeth are not usually brushed	1	0.5	0.9
	My child does not use toothpaste	2	0.4	0.4
	Picture 1 pea-sized amount of toothpaste	3	44.1	42.4
	Picture 2 half brush of toothpaste	4	42.1	42.3
	Picture 3 full brush of toothpaste	5	12.4	13.3
	Picture 4 overflowing brush of toothpaste	6	1.0	1.1
Total		100.3	100.5	100.4

**Q3b. These pictures show children rinsing their teeth after brushing.
Which picture shows what your child does?**

			NO MC (%)	MC (%)	Total (%)
	My child's teeth are not usually brushed	1	0.4	0.9	0.6
	Picture 1				
	using the toothbrush to rinse	2	34.3	23.1	32.0
	Picture 2				
	rinsing directly from the tap	3	26.2	29.2	26.7
	Picture 3				
	cupping hands to rinse	4	6.9	7.7	7.1
	Picture 4				
	using glass to rinse	5	29.4	37.0	30.9
	My child does not rinse	6	2.5	1.8	2.4
	None of these	7	0.4	0.5	0.5
Total			100.1	100.2	100.1

**Q4. How often does your child eat sweet food or sweet drinks
(such as biscuits, cakes, sweets, Coca-Cola, Pepsi-Cola, 7-Up, Ribena,
fruit drinks, etc.) between normal meals?**

			NO MC (%)	MC (%)	Total (%)
Never	1	0.5	1.6	0.9	
Less than once a day: (e.g., once a week, every second day)	2	12.8	16.8	13.3	
Once a day	3	32.2	27.2	31.3	
Twice a day	4	32.4	30.7	32.1	
Three times a day	5	14.7	15.2	14.8	
Four times a day	6	4.4	4.7	4.5	
Five times a day	7	1.4	0.8	1.4	
Six times or more a day	8	1.0	2.8	1.3	
Don't know	9	1.0	1.3	1.1	
Total		100.4	101.1	100.6	

Q5. When your son/daughter was a baby did he/she ever have baby or infant formula, or follow-on milk like Progress or Junior Milk (not liquid cow's milk)?

		NO MC (%)	MC (%)	Total (%)
Yes	1	88.5	83.8	87.4
No/Never	2	10.5	12.9	11.2
Don't know	3	1.0	3.3	1.4
Total		100.0	100.0	100.0

Q6. How old was your son/daughter when he/she started to drink baby or infant formula, or follow-on milk like Progress or Junior Milk (not liquid cow's milk)?

		NO MC (%)	MC (%)	Total (%)
Under 1 month	1	54.2	61.4	55.4
1 month – under 2 months	2	9.1	5.4	8.3
2 months – under 4 months	3	13.1	5.5	11.4
4 months – under 6 months	4	9.5	7.7	9.3
6 months – under 9 months	5	7.1	7.8	7.3
9 months – under 1 year	6	3.7	5.5	4.1
1 year – under 1 1/2 years	7	2.5	5.2	3.1
1 1/2 years – under 2 years	8	0.6	1.3	0.8
2 years – under 2 1/2 years	9	0.3	0.4	0.4
2 1/2 years – under 3 years	10	0.2	0.5	0.3
3 years or older	11	0.0	0.0	0.0
Total		100.3	100.5	100.4

Q7. How old was your son/daughter when he/she stopped having baby or infant formula, or follow-on milk like Progress or Junior Milk, even just at bedtime?

		NO MC (%)	MC (%)	Total (%)
Under 1 month	1	0.4	0.7	0.5
1 month – under 2 months	2	0.4	0.2	0.3
2 months – under 4 months	3	0.9	2.3	1.2
4 months – under 6 months	4	2.0	4.5	2.5
6 months – under 9 months	5	6.9	7.2	7.0
9 months – under 1 year	6	23.4	17.7	22.4
1 year – under 1 1/2 years	7	44.5	37.6	42.8
1 1/2 years – under 2 years	8	12.8	17.5	14.0
2 years – under 2 1/2 years	9	5.3	8.3	6.0
2 1/2 years – under 3 years	10	2.3	2.9	2.5
3 years or older	11	1.4	1.5	1.4
Total		100.3	100.4	100.3

Q8. If your child had a painful baby tooth would you prefer if it was				
		NO MC (%)	MC (%)	Total (%)
Filled	1	45.3	34.6	42.7
Taken out	2	38.8	51.8	41.7
Don't know/No opinion	3	16.0	13.6	15.6
Total		100.0	100.0	100.0

Q9. If your child had a painful back tooth and it was not a baby (milk) tooth but a second (permanent) tooth, would you prefer if it was				
		NO MC (%)	MC (%)	Total (%)
Filled	1	91.8	80.7	89.3
Taken out	2	4.3	12.5	6.1
Don't know/No opinion	3	3.9	6.9	4.6
Total		100.0	100.0	100.0

Q10. If your child had a painful front tooth and it was not a baby (milk) tooth but a second (permanent) tooth, would you rather it was				
		NO MC (%)	MC (%)	Total (%)
Filled	1	94.5	88.0	93.1
Taken out	2	0.8	3.7	1.4
Don't know/No opinion	3	4.7	8.5	5.5
Total		100.1	100.2	100.1

Q11. Are you happy with the colour of your child's front teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	72.1	65.1	70.4
No	2	25.5	31.9	27.0
Don't know/No opinion	3	2.4	3.0	2.5
Total		100.0	100.0	100.0

Q12. Have you noticed any brown, creamy or white marks on your child's front teeth which don't brush off?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	27.4	34.0	28.8
No	2	70.8	62.6	68.9
Don't know	3	1.9	3.4	2.3
Total		100.0	100.0	100.0

Q13. Please complete as applicable:				
		NO MC (%)	MC (%)	Total (%)
My child had his/her first visit to a dentist (including school dentist) at the age of	1	89.3	85.0	88.5
My child has never been to a dentist	2	11.7	16.5	12.7
Total		101.1	101.5	101.1
		NO MC (%)	MC (%)	Total (%)
My child had his/her first visit to a dentist (including school dentist) at the age of				
4 years or less	1	33.0	25.4	31.5
5 or 6 years	2	39.6	40.1	39.9
7 or 8 years	3	27.2	33.5	28.2
9 years or more	4	0.3	1.5	0.6
Total		100.1	100.6	100.2

Q14. What was the reason for this first visit?				
		NO MC (%)	MC (%)	Total (%)
Check up	1	44.6	37.2	43.0
I felt treatment was needed but my child had no pain	2	8.3	6.1	7.9
My child was in pain	3	14.1	18.3	14.9
Was sent an appointment by school dentist	4	20.0	21.9	20.5
Other (e.g., trauma to teeth)	5	5.0	4.3	4.8
My child has never been to the dentist	6	8.0	12.2	8.9
Total		100.0	100.0	100.0

Q15. How often does your child go to the dentist?				
		NO MC (%)	MC (%)	Total (%)
Occasionally	1	25.3	28.1	25.9
Every six months or more often	2	10.9	9.6	10.7
Every 6 – 12 months	3	21.1	18.6	20.6
Every 12 – 24 months	4	17.3	12.4	16.2
Every 2 years/more	5	10.7	11.0	10.7
My child has never been to the dentist	6	14.7	20.3	16.0
Total		100.0	100.0	100.0

Q16. In the last 6 months, have you (or your partner) ever had to take time off work to bring your child to a dentist because he/she had toothache?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	9.0	11.4	9.4
No	2	89.9	82.0	88.1
I (or my partner) have not been working (employed) in the last 6 months	3	1.1	6.6	2.5
Total		100.0	100.0	100.0

Q17. In the last 6 months, have you ever had a sleepless night because your child was awake with toothache (excluding teething/cutting teeth)?

		NO MC (%)	MC (%)	Total (%)
Yes	1	3.6	9.8	4.8
No	2	96.4	90.2	95.2
Total		100.0	100.0	100.0

Q18. In the last 6 months, has your child ever missed school because of toothache?

		NO MC (%)	MC (%)	Total (%)
Yes	1	3.2	8.1	4.1
No	2	96.8	91.9	95.9
Total		100.0	100.0	100.0

Q19. Please complete as applicable:

My child last went to the dentist at the age of		NO MC (%)	MC (%)	Total (%)
4 years or less	1	2.9	3.5	3.1
5 or 6 years	2	15.1	16.7	15.7
7 or 8 years	3	80.1	76.5	79.2
9 years or more	4	1.8	3.2	2.1
Total		100.0	100.0	100.0

		NO MC (%)	MC (%)	Total (%)
My child last went to the dentist at the age of	1	63.4	58.1	62.1
My child is currently undergoing treatment	2	20.0	18.2	18.7
My child has never been to the dentist	3	16.6	23.8	19.1
Total		100.0	100.0	100.0

Q20. When your child does go to the dentist, why does he/she normally go?

		NO MC (%)	MC (%)	Total (%)
For a check-up every 6 months or at least once a year	1	26.9	20.1	25.6
For a check-up at least every two years	2	10.2	7.7	9.7
When I or my child feels he/she needs treatment	3	10.1	10.3	10.2
When my child is in pain or has a problem	4	8.3	11.8	8.9
When sent an appointment by the Health Board (school) dentist	5	32.7	32.8	32.5
My child has never been to the dentist	6	11.9	17.4	13.1
Total		100.0	100.0	100.0

Q21. Was your child's last visit to the dentist:				
		NO MC (%)	MC (%)	Total (%)
To a private dentist	1	22.0	7.3	18.8
To the Health Board (school) dentist	2	63.5	71.8	65.2
To the Dental Hospital	3	2.7	3.6	3.0
My child has never visited a dentist	4	11.9	17.3	13.1
Total		100.0	100.0	100.0

Q22. Were you satisfied with the service your child received last?				
		NO MC (%)	MC (%)	Total (%)
Very satisfied	1	47.9	39.3	46.1
Satisfied	2	36.0	39.2	36.5
No opinion/Doesn't concern me	3	0.4	0.4	0.4
Dissatisfied	4	3.5	3.2	3.4
Very dissatisfied	5	0.7	1.4	0.9
My child has never visited a dentist	6	11.8	16.9	13.0
Total		100.2	100.3	100.3

Q23. Not all parents sit in the room with their child when the child is receiving dental treatment. Would you prefer to be in the room with your child when he/she receives treatment?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	67.0	64.9	66.4
No	2	8.2	13.3	9.1
Don't mind	3	11.4	9.3	11.2
Depends on the advice of the dentist/dental hygienist/dental nurse	4	13.4	12.5	13.3
Total		100.0	100.0	100.0

Q24. If your child had a toothache today could you get emergency treatment locally?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	66.5	57.5	64.4
No	2	9.1	14.8	10.4
Don't know	3	24.4	27.6	25.2
Total		100.0	100.0	100.0

Q25. Where would you get this emergency treatment?				
		NO MC (%)	MC (%)	Total (%)
Private dentist	1	47.8	22.2	42.2
Health Board (school) dentist	2	32.8	53.8	37.4
Dental hospital	3	2.5	2.7	2.8
Don't know	4	16.9	21.3	17.7
Total		100.0	100.0	100.0

Q26. Which type of dental service does your child normally use?				
		NO MC (%)	MC (%)	Total (%)
Private dentist	1	25.9	6.9	21.7
Health Board (school dentist) dental clinic	2	61.6	75.5	64.5
Dental hospital	3	1.1	2.2	1.4
My child has never been to the dentist	4	11.4	15.5	12.4
Total		100.0	100.0	100.0

Q27a. If you want to bring your child to the Health Board (school) dentist, how long do you think you'll have to wait for an appointment for relief of pain?				
I think my child would be seen for emergency treatment on:		NO MC (%)	MC (%)	Total (%)
Same day	1	27.7	37.8	29.6
Following day	2	13.3	14.0	13.6
Less than three days	3	11.5	9.5	11.3
More than three days	4	9.1	9.7	9.2
Don't Know	5	38.4	29.0	36.2
Total		100.0	100.0	100.0

Q28b. If you want to bring your child to the Health Board (school) dentist how long do you think you'll have to wait for an appointment for routine dental treatment (e.g., permanent fillings)?				
I think my child would be seen for routine treatment in:		NO MC (%)	MC (%)	Total (%)
Less than one week	1	10.3	17.8	11.7
Less than one month	2	27.1	28.2	27.6
Less than six months	3	13.4	12.8	13.4
Six months or more	4	8.7	4.9	7.9
My child would not receive routine treatment unless the Health Board (school) dentist called my child in for treatment	5	14.8	14.5	14.6
Don't know	6	25.7	21.9	24.9
Total		100.0	100.0	100.0

Q29. Are you satisfied with the availability of information on the Health Board (school) dental service for your child? That is, are you satisfied with				
a) Where to find information on the Health Board (school) dental service?		NO MC (%)	MC (%)	Total (%)
Yes	1	44.2	57.2	47.0
No	2	50.0	38.9	47.6
Not relevant to me	3	5.7	3.8	5.4
Total		100.0	100.0	100.0

b) How you and your child's rights are protected within the Health Board(school) dental service?		NO MC (%)	MC (%)	Total (%)
Yes	1	49.3	64.7	52.8
No	2	37.3	25.4	34.6
Not relevant to me	3	13.3	9.9	12.6
Total		100.0	100.0	100.0

c) Where to complain if you are not satisfied?		NO MC (%)	MC (%)	Total (%)
Yes	1	34.6	39.9	35.4
No	2	52.1	45.7	50.9
Not relevant to me	3	13.3	14.4	13.6
Total		100.0	100.0	100.0

Q30. Has your child ever received treatment from the Health Board (school) dental service?

		NO MC (%)	MC (%)	Total (%)
Yes	1	58.9	56.0	58.3
No	2	41.1	44.0	41.7
Total		100.0	100.0	100.0

Q31. When your child used the Health Board (school) dental service was it for:

		NO MC (%)	MC (%)	Total (%)
Emergency treatment (relief of pain, trauma)	1	20.5	20.3	20.6
Routine treatment (permanent fillings)	2	60.2	54.5	59.2
Both – emergency and routine treatment	3	19.3	25.2	20.2
Total		100.0	100.0	100.0

Q32. How many times has your child ever been called by the Health Board (school) dental service for an examination/course of treatment?

		NO MC (%)	MC (%)	Total (%)
Once	1	41.1	32.7	39.0
Twice	2	18.7	20.8	19.6
Three times	3	8.8	10.7	9.3
Four times or more	4	7.0	10.8	7.7
Never been called, I contacted the Health Board (school) dentist myself for an appointment for my child	5	24.3	25.0	24.5
Total		100.0	100.0	100.0

Q33. Were you satisfied with the range of treatments covered under the school dental service?

		NO MC (%)	MC (%)	Total (%)
Very satisfied	1	22.6	27.3	24.0
Satisfied	2	53.0	54.4	53.0
No opinion/Doesn't concern me	3	9.0	6.0	8.2
Dissatisfied	4	10.4	9.0	10.2
Very dissatisfied	5	5.1	3.4	4.7
Total		100.0	100.0	100.0

Q34. Overall, are you satisfied with the Health Board (school) service your child receives?

		NO MC (%)	MC (%)	Total (%)
Very satisfied	1	18.6	27.6	20.9
Satisfied	2	52.3	55.6	53.1
No opinion/Doesn't concern me	3	5.5	3.1	4.9
Dissatisfied	4	17.4	10.4	15.8
Very dissatisfied	5	6.2	3.3	5.4
Total		100.0	100.0	100.0

Q35a. Have you ever experienced any problems getting dental treatment for your child?

		NO MC (%)	MC (%)	Total (%)
Yes	1	11.8	8.8	11.2
No	2	88.2	91.2	88.8
Total		100.0	100.0	100.0

Q35b. If you answered Yes to Q35a, please tick any of the statements below that apply to your child's situation:

		NO MC (%)	MC (%)	Total (%)
My child is on a waiting list for treatment/examination	1	13.9	17.8	15.2
Not Selected		86.1	82.2	84.8
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
My child is on a waiting list for treatment/examination for more than 6 months	2	7.7	7.7	7.7
Not Selected		92.3	92.3	92.3
Total		100.0	100.0	100.0

		NO MC (%)	MC (%)	Total (%)
I don't know what treatment my child is entitled to or where to access that treatment	3	42.3	31.6	39.7
Not Selected		57.7	68.4	60.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
My child could not be treated at the local clinic and had to be referred to the hospital/specialised center	4	6.6	8.6	6.7
Not Selected		93.4	91.4	93.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
My child has not been contacted by the Health Board(school) dentist for treatment	5	41.8	36.1	40.2
Not Selected		58.2	63.9	59.8
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
The dental clinic/hospital is too far away	6	1.9	7.0	2.9
Not Selected		98.2	93.4	97.2
Total		100.1	100.4	100.2
		NO MC (%)	MC (%)	Total (%)
It is too difficult to get a suitable appointment	7	6.6	5.5	6.3
Not Selected		93.4	94.5	93.7
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
The Health Centre (dental clinic) is physically inaccessible (for example, it has no wheelchair access)	8	0.8	8.7	2.0
Not Selected		99.5	94.6	98.8
Total		100.3	103.4	100.8
		NO MC (%)	MC (%)	Total (%)
I would have to take time off work to bring my child to a dentist	9	14.2	6.9	12.8
Not Selected		85.8	93.1	87.2
Total		100.0	100.0	100.0

		NO MC (%)	MC (%)	Total (%)
My child would miss too much school time	10	2.2	5.8	2.9
Not Selected		98.2	95.2	97.6
Total		100.4	101.0	100.5
		NO MC (%)	MC (%)	Total (%)
My child is uncooperative for examination or treatment	11	2.4	4.9	2.7
Not Selected		98.8	97.6	98.7
Total		101.2	102.5	101.4
		NO MC (%)	MC (%)	Total (%)
My child is too nervous	12	4.7	9.2	5.7
Not Selected		95.3	90.8	94.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Other, Please specify:	13	8.8	9.2	8.9
Not Selected		91.2	90.8	91.1
Total		100.0	100.0	100.0

Q36. How many hours would your child sit in front of a TV, game console or computer

		NO MC (%)	MC (%)	Total (%)
On an average weekday				
Less than 1 hour	1	2.5	3.5	2.6
1 hour - < 2 hours	2	36.5	24.1	33.8
2 hours - < 3 hours	3	39.8	41.0	39.8
3 hours or more	4	21.3	31.4	23.8
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
On an average Saturday or Sunday				
Less than 1 hour	1	2.8	6.4	3.4
1 hour - <2 hours	2	9.9	8.3	9.4
2 hours - < 3 hours	3	27.6	19.0	25.9
3 hours or more	4	60.2	67.6	62.0
Total		100.5	101.2	100.7

Q37. How many children do you have?

		NO MC (%)	MC (%)	Total (%)
One Child	1	6.2	10.3	7.0
Two Children	2	31.8	24.2	30.0
Three Children	3	35.3	24.1	32.5
Four or more children	4	26.8	41.5	30.5
Total		100.0	100.0	100.0

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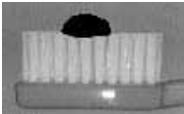
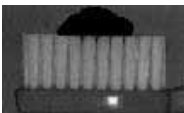


Q1. At what age did you or your child start brushing your child's teeth?

		NO LIB (%)	LIB (%)	Total (%)
My child's teeth are not usually brushed	1	0.0	0.8	0.3
Before 12 months of age	2	57.2	44.8	51.5
Between 12 and 18 months of age	3	32.7	32.8	32.8
Between 19 and 24 months of age	4	5.7	10.5	7.9
After 24 months of age	5	4.4	11.2	7.5
Total		100.0	100.0	100.0





Q2. How often does your child brush his/her teeth (or have them brushed for him/her)?

		NO LIB (%)	LIB (%)	Total (%)
My child's teeth are not usually brushed	1	0.0	2.2	1.0
Less than once a day (e.g., every second day, once a week)	2	3.8	9.0	6.1
Once a day	3	22.6	33.6	27.6
Twice a day	4	71.1	52.2	62.5
More than twice a day	5	2.5	3.0	2.7
Total		100.0	100.0	100.0

Q3a. These pictures show different amounts of toothpaste on a brush. Which picture shows the amount of toothpaste your child uses?

			NO LIB (%)	LIB (%)	Total (%)
	My child's teeth are not usually brushed	1	0.0	1.5	0.7
	My child does not use toothpaste	2	0.6	0.8	0.7
	Picture 1 pea-sized amount of toothpaste	3	38.4	41.0	39.6
	Picture 2 half brush of toothpaste	4	47.2	36.6	42.3
	Picture 3 full brush of toothpaste	5	13.8	19.4	16.4
	Picture 4 overflowing brush of toothpaste	6	0.0	0.8	0.3
Total			100.0	100.0	100.0

**Q3b. These pictures show children rinsing their teeth after brushing.
Which picture shows what your child does?**

		NO LIB (%)	LIB (%)	Total (%)	
	My child's teeth are not usually brushed	1	0.0	0.8	0.3
	Picture 1				
	using the toothbrush to rinse	2	34.6	24.6	30.0
	Picture 2				
	rinsing directly from the tap	3	25.8	30.6	28.0
	Picture 3				
	cupping hands to rinse	4	8.2	6.0	7.2
	Picture 4				
	using glass to rinse	5	28.3	35.8	31.7
	My child does not rinse	6	3.1	2.2	2.7
	None of these	7	0.0	1.0	2.0
Total			100.0	101.0	102.0

Q4. How often does your child eat sweet food or sweet drinks (such as biscuits, cakes, sweets, Coca-Cola, Pepsi-Cola, 7-Up, Ribena, fruit drinks, etc.) between normal meals?

		NO LIB (%)	LIB (%)	Total (%)
Never	1	0.6	0.8	0.7
Less than once a day: (e.g., once a week, every second day)	2	15.7	11.2	13.7
Once a day	3	32.7	23.9	28.7
Twice a day	4	30.2	34.3	32.1
Three times a day	5	12.6	20.1	16.0
Four times a day	6	5.0	6.0	5.5
Five times a day	7	1.9	0.8	1.4
Six times or more a day	8	1.3	2.2	1.7
Don't know	9	0.0	0.8	0.3
Total		100.0	100.0	100.0

Q5. When your son/daughter was a baby did he/she ever have baby or infant formula, or follow-on milk like Progress or Junior Milk (not liquid cow's milk)?

		NO LIB (%)	LIB (%)	Total (%)
Yes	1	84.8	86.7	85.7
No/Never	2	13.9	13.3	13.6
Don't know	3	1.3	0.0	0.7
Total		100.0	100.0	100.0

Q6. How old was your son/daughter when he/she started to drink baby or infant formula, or follow-on milk like Progress or Junior Milk (not liquid cow's milk)?

		NO LIB (%)	LIB (%)	Total (%)
Under 1 month	1	55.1	68.0	61.1
1 month – under 2 months	2	5.8	2.5	4.2
2 months – under 4 months	3	13.0	6.6	10.0
4 months – under 6 months	4	5.8	7.4	6.5
6 months – under 9 months	5	9.4	9.0	9.2
9 months – under 1 year	6	7.3	6.6	6.9
1 year – under 1½ years	7	2.9	0.0	1.5
1½ years – under 2 years	8	0.7	0.0	0.4
2 years – under 2½ years	9	0.0	0.0	0.0
2½ years – under 3 years	10	0.0	0.0	0.0
3 years or older	11	0.0	0.0	0.0
Total		100.0	100.0	100.0

Q7. How old was your son/daughter when he/she stopped having baby or infant formula, or follow-on milk like Progress or Junior Milk, even just at bedtime?

		NO LIB (%)	LIB (%)	Total (%)
Under 1 month	1	0.0	0.0	0.0
1 month – under 2 months	2	0.0	0.0	0.0
2 months – under 4 months	3	0.0	0.8	0.4
4 months – under 6 months	4	2.2	1.7	2.0
6 months – under 9 months	5	10.2	16.0	12.9
9 months – under 1 year	6	21.9	25.2	23.4
1 year – under 1½ years	7	46.7	44.5	45.7
1½ years – under 2 years	8	13.9	8.4	11.3
2 years – under 2½ years	9	2.9	1.7	2.3
2½ years – under 3 years	10	2.2	0.8	1.6
3 years or older	11	0.0	0.8	0.4
Total		100.0	100.0	100.0

Q8. If your child had a painful baby tooth would you prefer if it was				
		NO LIB (%)	LIB (%)	Total (%)
Filled	1	42.2	40.1	41.3
Taken out	2	43.5	47.7	45.5
Don't know/No opinion	3	14.3	12.1	13.3
Total		100.0	100.0	100.0

Q9. If your child had a painful back tooth and it was not a baby (milk) tooth but a second (permanent) tooth, would you prefer if it was				
		NO LIB (%)	LIB (%)	Total (%)
Filled	1	91.7	87.1	89.6
Taken out	2	1.3	8.3	4.5
Don't know/No opinion	3	7.0	4.6	5.9
Total		100.0	100.0	100.0

Q10. If your child had a painful front tooth and it was not a baby (milk) tooth but a second (permanent) tooth, would you rather it was				
		NO LIB (%)	LIB (%)	Total (%)
Filled	1	90.5	91.7	91.0
Taken out	2	1.9	4.6	3.1
Don't know/No opinion	3	7.6	3.8	5.9
Total		100.0	100.0	100.0

Q11. Are you happy with the colour of your child's front teeth?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	70.3	75.6	72.7
No	2	27.7	21.4	24.8
Don't know/No opinion	3	1.9	3.1	2.5
Total		100.0	100.0	100.0

Q12. Have you noticed any brown, creamy or white marks on your child's front teeth which don't brush off?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	27.1	27.3	27.2
No	2	72.3	69.7	71.1
Don't know	3	0.7	3.0	1.7
Total		100.0	100.0	100.0

Q13. Please complete as applicable:

		NO LIB (%)	LIB (%)	Total (%)
My child had his/her first visit to a dentist (including school dentist) at the age of	1	99.3	97.7	98.6
My child has never been to a dentist	2	0.7	2.3	1.4
Total		100.0	100.0	100.0

		NO LIB (%)	LIB (%)	Total (%)
My child had his/her first visit to a dentist (including school dentist) at the age of				
4 years or less	1	93.4	87.0	90.5
5 or 6 years	2	5.3	13.0	8.8
7 or 8 years	3	1.3	0.0	0.7
9 years or more	4	0.0	1.0	2.0
Total		100.0	101.0	102.0

Q14. What was the reason for this first visit?

		NO LIB (%)	LIB (%)	Total (%)
Check up	1	91.1	80.3	86.2
I felt treatment was needed but my child had no pain	2	1.9	4.6	3.1
My child was in pain	3	2.6	6.8	4.5
Was sent an appointment by school dentist	4	1.9	4.6	3.1
Other (e.g., trauma to teeth)	5	1.9	2.3	2.1
My child has never been to the dentist	6	0.6	1.5	1.0
Total		100.0	100.0	100.0

Q15. How often does your child go to the dentist?

		NO LIB (%)	LIB (%)	Total (%)
Occasionally	1	1.3	5.3	3.1
Every six months or more often	2	53.2	40.1	47.2
Every 6 – 12 months	3	41.1	43.9	42.4
Every 12 – 24 months	4	3.8	6.1	4.8
Every 2 years/more	5	0.0	3.0	1.4
My child has never been to the dentist	6	0.6	1.5	1.0
Total		100.0	100.0	100.0

Q16. In the last 6 months, have you (or your partner) ever had to take time off work to bring your child to a dentist because he/she had toothache?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	12.6	14.4	13.4
No	2	86.8	74.2	81.1
I (or my partner) have not been working (employed) in the last 6 months	3	0.6	11.4	5.5
Total		100.0	100.0	100.0

Q17. In the last 6 months, have you ever had a sleepless night because your child was awake with toothache (excluding teething/cutting teeth)?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	5.7	7.6	6.6
No	2	94.3	92.4	93.5
Total		100.0	100.0	100.0

Q18. In the last 6 months, has your child ever missed school because of toothache?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	2.5	6.9	4.5
No	2	97.5	93.1	95.5
Total		100.0	100.0	100.0

Q19. Please complete as applicable:				
		NO LIB (%)	LIB (%)	Total (%)
My child <u>last</u> went to the dentist at the age of				
4 years or less	1	1.4	3.3	2.2
5 or 6 years	2	2.1	6.6	4.1
7 or 8 years	3	93.8	89.3	91.8
9 years or more	4	2.7	0.8	1.9
Total		100.0	100.0	100.0
		NO LIB (%)	LIB (%)	Total (%)
My child <u>last</u> went to the dentist at the age of	1	92.4	88.5	90.6
My child is currently undergoing treatment	2	7.0	9.2	8.0
My child has never been to the dentist	3	0.6	2.3	1.4
Total		100.0	100.0	100.0

Q20. When your child does go to the dentist, why does he/she normally go?				
		NO LIB (%)	LIB (%)	Total (%)
For a check-up every 6 months or at least once a year	1	91.2	82.0	87.0
For a check-up at least every two years	2	5.0	5.3	5.1
When I or my child feels he/she needs treatment	3	1.3	6.0	3.4
When my child is in pain or has a problem	4	1.9	4.5	3.1
When sent an appointment by the school dentist	5	0.0	1.5	0.7
My child has never been to the dentist	6	0.6	0.8	0.7
Total		100.0	100.0	100.0

Q21. Was your child's last visit to the dentist:				
		NO LIB (%)	LIB (%)	Total (%)
To a private dentist	1	71.5	38.6	56.5
To the community dentist	2	27.2	56.8	40.7
To the Dental Hospital	3	0.6	3.8	2.1
My child has never visited a dentist	4	0.6	0.8	0.7
Total		100.0	100.0	100.0

Q22. Were you satisfied with the service your child received last?				
		NO LIB (%)	LIB (%)	Total (%)
Very satisfied	1	71.1	67.4	69.4
Satisfied	2	28.3	30.3	29.2
No opinion/Doesn't concern me	3	0.0	0.8	0.3
Dissatisfied	4	0.0	0.8	0.3
Very dissatisfied	5	0.0	0.0	0.0
My child has never visited a dentist	6	0.6	0.8	0.7
Total		100.0	100.0	100.0

Q23. Not all parents sit in the room with their child when the child is receiving dental treatment. Would you prefer to be in the room with your child when he/she receives treatment?				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	86.2	80.5	83.6
No	2	2.5	6.0	4.1
Don't mind	3	6.3	7.5	6.9
Depends on the advice of the dentist/dental hygienist/dental nurse	4	5.0	6.0	5.5
Total		100.0	100.0	100.0

Q24. If your child had a toothache today could you get emergency treatment				
		NO LIB (%)	LIB (%)	Total (%)
Yes	1	75.3	76.5	75.9
No	2	6.3	7.6	6.9
Don't know	3	18.4	15.9	17.2
Total		100.0	100.0	100.0

Q25. Where would you get this emergency treatment?				
		NO LIB (%)	LIB (%)	Total (%)
Private dentist	1	61.9	29.0	46.9
Community dentist	2	23.2	49.6	35.3
Dental hospital	3	2.6	4.6	3.5
Don't know	4	12.3	16.8	14.3
Total		100.0	100.0	100.0

Q26. Which type of dental service does your child normally use?				
		NO LIB (%)	LIB (%)	Total (%)
Private dentist	1	71.8	38.0	56.5
Community dental clinic	2	27.6	60.5	42.5
Dental hospital	3	0.0	1.0	2.0
My child has never been to the dentist	4	0.6	1.6	1.1
Total		100.0	101.0	102.0

Q27. How many hours would your child sit in front of a TV, game console or computer				
On an average weekday				
		NO LIB (%)	LIB (%)	Total (%)
Less than 1 hour	1	1.3	0.8	1.1
1 hour - < 2 hours	2	44.7	32.5	39.3
2 hours - < 3 hours	3	38.2	35.0	36.8
3 hours or more	4	15.8	31.7	22.8
Total		100.0	100.0	100.0
On an average Saturday or Sunday				
		NO LIB (%)	LIB (%)	Total (%)
Less than 1 hour	1	1.5	1.0	1.3
1 hour - < 2 hours	2	15.4	10.3	13.2
2 hours - < 3 hours	3	31.5	23.7	28.2
3 hours or more	4	51.5	65.0	57.3
Total		100.0	100.0	100.0

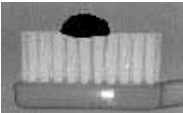

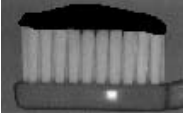
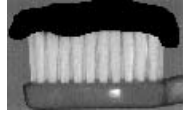
Q28. How many children do you have?				
		NO LIB (%)	LIB (%)	Total (%)
One Child	1	7.0	11.5	9.1
Two Children	2	42.0	27.7	35.5
Three Children	3	29.9	29.2	29.6
Four or more children	4	21.0	31.5	25.8
Total		100.0	100.0	100.0

Republic of Ireland Questionnaire for Junior Cert Students





Q1. How often do you brush your teeth?

		NO MC (%)	MC (%)	Total (%)
Never	1	0.5	1.3	0.8
Less than once a day — e.g. every second day, once a week	2	7.9	10.4	8.7
Once a day	3	31.3	36.8	33.1
Twice a day	4	53.2	46.3	51.0
More than twice a day	5	7.1	5.2	6.5
Total		100.0	100.0	100.0

Q2a. These pictures show different amounts of toothpaste on a brush. What picture shows the amount of toothpaste you use?

		NO MC (%)	MC (%)	Total (%)	
	I do not brush my teeth	1	2.2	3.2	2.4
	I brush but do <u>not</u> use toothpaste	2	0.2	1.0	0.3
	Picture 1				
	<u>pea-sized</u> amount of toothpaste	3	15.6	11.4	14.7
	Picture 2				
	<u>half brush</u> of toothpaste	4	43.0	40.9	42.3
	Picture 3				
	<u>full brush</u> of toothpaste	5	36.6	40.7	37.9
	Picture 4				
	<u>overflowing brush</u> of toothpaste	6	2.4	3.2	2.5
Total		100.1	100.4	100.1	

Q2b. These pictures show children rinsing their teeth after brushing. Which picture shows what you do?

		NO	MC (%)	MC (%)	Total (%)
	I do not brush my teeth	1	0.7	1.7	1.0
	Picture 1	2	19.9	15.7	18.9
	using the toothbrush to rinse				
	Picture 2	3	43.8	39.4	42.7
	rinsing directly from the tap				
	Picture 3	4	9.6	8.8	9.4
	cupping hands to rinse				
	Picture 4				
	using glass to rinse	5	23.2	32.4	25.4
	I do not rinse	6	2.1	1.2	1.9
	None of these	7	1.0	1.2	1.0
Total			100.3	100.4	100.3

Q3. How often do you eat sweet food or sweet drinks (such as biscuits, cakes, sweets, Coca-Cola, Pepsi-cola, 7-up, Fruit Drinks, Ribena etc.) between normal meals?

		NO	MC (%)	MC (%)	Total (%)
Never	1	0.9	1.1	0.9	
Less than once a day: e.g once a week, every second day	2	8.7	7.5	8.5	
Once a day	3	23.5	18.8	22.4	
Twice a day	4	27.7	27.4	28.0	
Three times a day	5	17.0	15.7	16.4	
Four times a day	6	5.6	7.3	5.9	
Five times a day	7	2.1	2.1	2.1	
Six times or more a day	8	2.0	5.1	2.8	
Don't know	9	12.6	15.2	13.1	
Total			100.1	100.1	100.1

Q4. Do you drink any of the following at least once a day:				
		NO MC (%)	MC (%)	Total (%)
Pure fruit juice (e.g. Squeez orange juice, Tropicana)	1	50.0	41.7	47.8
Not Selected		50.1	58.3	52.2
		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Fizzy soft drinks (Coca Cola, 7Up)	2	61.5	72.1	63.8
Not Selected		38.5	27.9	36.2
		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Carbonated water (e.g., Ballygowen)	3	29.5	27.3	28.8
Not Selected		70.5	72.7	71.2
		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Other types of soft drinks (e.g., Sunny Delight, Capri Sun)	4	19.1	22.8	20.1
Not Selected		80.9	77.2	79.9
Total		100.0	100.0	100.0

Q5. If you had a painful <u>back</u> tooth would you prefer it was filled or taken out ?				
		NO MC (%)	MC (%)	Total (%)
Filled	1	56.9	58.3	56.9
Taken Out	2	16.5	19.3	17.3
Don't Know/No Opinion	3	26.6	22.4	25.8
Total		100.0	100.0	100.0

Q6. If you had a painful <u>front</u> tooth would you prefer if it was filled or taken				
		NO MC (%)	MC (%)	Total (%)
Filled	1	77.0	76.6	76.8
Taken Out	2	4.6	6.4	5.1
Don't Know/No opinion	3	18.4	17.0	18.1
Total		100.0	100.0	100.0

Q7. Are you happy with the colour of your front teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	51.1	47.4	50.1
No	2	37.1	41.7	38.3
Don't know/No opinion	3	11.8	10.9	11.6
Total		100.0	100.0	100.0

Q8. Have you noticed any brown, creamy or white marks on your front teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	35.4	37.4	35.9
No	2	46.5	42.0	45.4
Don't know	3	18.1	20.6	18.8
Total		100.0	100.0	100.0

Q9. How do you feel about the position/alignment of your teeth?				
		NO MC (%)	MC (%)	Total (%)
Very satisfied	1	17.6	12.9	16.2
Satisfied	2	46.5	45.4	46.4
No opinion/indifferent	3	12.4	15.6	13.2
Dissatisfied	4	19.2	19.9	19.2
Very Dissatisfied	5	4.4	6.2	5.0
Total		100.0	100.0	100.0

Q10. Would you be willing to wear a brace to straighten your teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	32.9	34.0	32.9
No	2	30.1	39.6	32.8
Haven't ever thought about it	3	20.3	19.0	20.1
Currently undergoing treatment to straighten my teeth (wearing	4	12.3	3.9	10.0
Currently awaiting to be called for treatment	5	4.4	3.5	4.3
Total		100.0	100.0	100.0

Q11. Have you had orthodontic treatment in the past (i.e., braces or appliances to straighten your teeth)?				
		NO MC (%)	MC (%)	Total (%)
No	1	74.0	83.3	76.6
Yes	2	15.5	11.6	14.2
Currently undergoing orthodontic treatment	3	10.5	5.1	9.2
Total		100.0	100.0	100.0

Q12. What kind of clinic was/is the treatment provided at?				
		NO MC (%)	MC (%)	Total (%)
Private dentist	1	41.4	15.1	34.8
Health Board (school dentist) dental clinic	2	49.3	72.4	54.8
Dental Hospital	3	9.3	12.6	10.4
Total		100.0	100.0	100.0

Q13. How often do you go to the dentist (other than for an orthodontic visit)?				
		NO MC (%)	MC (%)	Total (%)
Never	1	12.5	17.9	13.8
Occasionally	2	22.1	23.6	22.5
Every six months or more often	3	16.6	10.3	15.0
Every 6 – 12 months	4	24.4	21.2	23.6
Every 12 – 24 months	5	14.7	14.0	14.7
Every 2 years/more	6	9.7	13.0	10.4
Total		100.0	100.0	100.0

Q14. When were you <u>last</u> at a dentist?				
		NO MC (%)	MC (%)	Total (%)
Primary school	1	17.0	23.1	18.7
1 st year in secondary school	2	16.1	17.7	16.7
2 nd year in secondary school	3	31.9	27.4	31.0
Junior Cert (present class)	4	31.6	27.4	30.1
Don't remember/Never been	5	3.3	4.4	3.6
Total		100.0	100.0	100.0

Q15. Was your last visit to the dentist (other than an orthodontic visit):				
		NO MC (%)	MC (%)	Total (%)
To a private dentist	1	31.8	13.3	27.1
To the health board (school dentist) clinic	2	54.2	68.8	57.5
Dental Hospital	3	7.2	9.4	7.8
Don't remember/Never been	4	6.8	8.5	7.5
Total		100.0	100.0	100.0

Q16. If you have not been to the dentist or have only been there once or twice since you left primary school is it because:				
		NO MC (%)	MC (%)	Total (%)
You haven't had any problems with your teeth	1	70.8	65.6	68.8
Not Selected		29.2	34.4	31.2
Total		100.0	100.0	100.0

		NO MC (%)	MC (%)	Total (%)
You have not been called since you left primary school	2	23.2	30.6	25.7
Not Selected		76.8	69.4	74.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You think that you are no longer entitled to free dental treatment	3	6.5	2.6	5.5
Not Selected		93.5	97.4	94.5
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You are entitled to free dental treatment but you could not get an appointment	4	1.6	1.4	1.6
Not Selected		98.4	98.6	98.4
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You or your parents could not afford to pay a private dentist	5	1.0	1.1	1.0
Not Selected		99.1	99.0	99.0
Total		100.1	100.1	100.1
		NO MC (%)	MC (%)	Total (%)
Other reason (please tick and write in below)	6	6.4	6.4	6.7
Not Selected		93.6	93.6	93.3
Total		100.0	100.0	100.0

Q17. In the last 6 months, have you ever had a sleepless night because you were awake with toothache?

		NO MC (%)	MC (%)	Total (%)
Yes	1	6.0	9.8	7.0
No	2	94.0	90.2	93.1
Total		100.0	100.0	100.0

Q18. In the last 6 months, have you ever missed school because of toothache?

		NO MC (%)	MC (%)	Total (%)
Yes	1	3.0	3.8	3.1
No	2	97.0	96.2	96.9
Total		100.0	100.0	100.0

Q19. Which type of dental service have you mainly used in the past?				
		NO MC (%)	MC (%)	Total (%)
Private dentist	1	27.4	11.6	23.5
Health Board (school dentist) dental clinic	2	64.2	78.0	67.3
Dental Hospital	3	6.1	7.0	6.5
Don't Remember/Never been to the dentist	4	2.4	3.5	2.7
Total		100.0	100.0	100.0

Q20. The last time you were waiting at the dentist for your turn in the chair, how did you feel?				
		NO MC (%)	MC (%)	Total (%)
Relaxed	1	48.7	41.3	47.1
A little worried	2	40.2	44.2	41.0
Frightened	3	5.3	6.6	5.7
So frightened I felt sick	4	4.5	5.1	4.6
Cannot remember/ I have never attended the dentist	5	1.3	2.8	1.6
Total		100.0	100.0	100.0

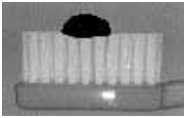
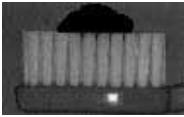
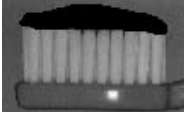
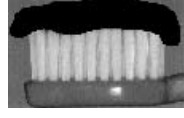
Q21. How many children are in your family including yourself?				
		NO MC (%)	MC (%)	Total (%)
One Child	1	5.0	5.3	4.8
Two Children	2	22.9	15.6	21.1
Three Children	3	29.5	24.2	28.3
Four or more children	4	42.6	55.0	45.8
Total		100.0	100.0	100.0

Northern Ireland Questionnaire for 4th Form Pupils





Q1. How often do you brush your teeth?

		NO MC (%)	MC (%)	Total (%)
Never	1	0.0	1.0	0.3
Less than once a day – e.g. every second day, once a week	2	5.8	4.8	5.4
Once a day	3	27.8	33.5	29.7
Twice a day	4	59.2	53.6	57.3
More than twice a day	5	7.3	7.2	7.2
Total		100.0	100.0	100.0

Q2a. These pictures show different amounts of toothpaste on a brush. What picture shows the amount of toothpaste you use?

		NO MC (%)	MC (%)	Total (%)
	I do not brush my teeth	1	1.2	1.4
	I brush but do <u>not</u> use toothpaste	2	0.3	0.2
	Picture 1			
	<u>pea-sized</u> amount of toothpaste	3	6.2	4.8
	Picture 2			
	<u>half brush</u> of toothpaste	4	37.1	26.3
	Picture 3			
	<u>full brush</u> of toothpaste	5	51.7	62.2
	Picture 4			
	<u>overflowing brush</u> of toothpaste	6	3.5	5.3
Total		100.0	100.0	100.0

**Q2b. These pictures show children rinsing their teeth after brushing.
Which picture shows what you do?**

			NO MC (%)	MC (%)	Total (%)
	I do not brush my teeth	1	0.3	1.0	0.5
	Picture 1	2	23.6	15.3	20.9
	using the toothbrush to rinse				
	Picture 2	3	35.1	41.1	37.7
	rinsing directly from the tap				
	Picture 3	4	12.9	10.1	11.7
	cupping hands to rinse				
	Picture 4				
	using glass to rinse	5	24.6	30.6	26.4
	I do not rinse	6	3.2	1.4	2.6
	None of these	7	0.3	0.5	0.3
Total			100.0	100.0	100.0

Q3. How often do you eat sweet food or sweet drinks (such as biscuits, cakes, sweets, Coca-Cola, Pepsi-cola, 7-up, Fruit Drinks, Ribena etc.) between normal meals?

			NO MC (%)	MC (%)	Total (%)
Never	1	0.8	0.5	0.6	
Less than once a day: e.g once a week, every second day	2	7.8	7.2	8.0	
Once a day	3	19.1	22.5	21.1	
Twice a day	4	30.9	23.4	27.8	
Three times a day	5	17.6	15.8	16.7	
Four times a day	6	7.0	6.2	6.6	
Five times a day	7	3.0	2.4	2.9	
Six times or more a day	8	4.3	4.3	4.2	
Don't know	9	9.6	17.7	12.1	
Total		100.0	100.0	100.0	

Q4. Do you drink any of the following at least once a day:				
		NO MC (%)	MC (%)	Total (%)
Pure fruit juice (e.g. Squeeze orange juice, Tropicana)	1	56.2	40.6	50.7
Not Selected		43.8	59.4	49.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Fizzy soft drinks (Coca Cola, 7Up)	2	63.7	75.8	67.4
Not Selected		36.3	24.1	32.6
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Carbonated water (e.g., Ballygowen)	3	39.7	29.9	35.7
Not Selected		60.3	70.1	64.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Other types of soft drinks (e.g., Sunny Delight, Capri Sun)	4	22.9	26.1	23.9
Not Selected		77.1	73.9	76.1
Total		100.0	100.0	100.0

Q5. If you had a painful <u>back</u> tooth would you prefer it was filled or taken out ?				
		NO MC (%)	MC (%)	Total (%)
Filled	1	58.5	61.1	59.4
Taken Out	2	14.0	22.1	16.4
Don't Know/No Opinion	3	27.5	16.8	24.2
Total		100.0	100.0	100.0

Q6. If you had a painful <u>front</u> tooth would you prefer if it was filled or taken out?				
		NO MC (%)	MC (%)	Total (%)
Filled	1	79.5	77.8	79.1
Taken Out	2	5.0	7.3	5.6
Don't Know/No opinion	3	15.5	15.0	15.3
Total		100.0	100.0	100.0

Q7. Are you happy with the colour of your front teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	47.8	43.5	46.6
No	2	40.5	44.0	41.4
Don't know/No opinion	3	11.7	12.6	12.0
Total		100.0	100.0	100.0

Q8. Have you noticed any brown, creamy or white marks on your front teeth?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	31.8	26.1	29.5
No	2	49.0	52.7	50.6
Don't know	3	19.1	21.3	19.9
Total		100.0	100.0	100.0

Q9. How often do you go to the dentist (other than for an orthodontic visit)?				
		NO MC (%)	MC (%)	Total (%)
Never	1	1.3	3.4	1.9
Occasionally	2	4.0	12.5	7.1
Every six months or more often	3	54.6	38.5	48.7
Every 6 – 12 months	4	34.3	38.9	36.2
Every 12 – 24 months	5	4.3	4.8	4.5
Every 2 years/more	6	1.5	1.9	1.6
Total		100.0	100.0	100.0

Q10. When were you last at a dentist?				
		NO MC (%)	MC (%)	Total (%)
Primary school	1	0.5	1.9	1.0
1 st year in secondary school	2	1.0	0.5	0.8
2 nd year in secondary school	3	3.3	3.4	3.2
3 rd year in secondary school	4	20.2	25.7	22.1
4 th year in secondary school (present class)	5	73.2	64.6	70.2
Don't remember/Never been	6	1.8	3.9	2.7
Total		100.0	100.0	100.0

Q11. Was your last visit to the dentist (other than an orthodontic visit):				
		NO MC (%)	MC (%)	Total (%)
To a family dentist	1	77.4	73.6	76.2
To a community dentist	2	20.4	22.1	21.0
To the school of dentistry	3	0.3	1.0	0.5
Don't remember/Never been	4	2.0	3.4	2.4
Total		100.0	100.0	100.0

Q12. If you have not been to the dentist or have only been there once or twice since you left primary school is it because:				
		NO MC (%)	MC (%)	Total (%)
You haven't had any problems with your teeth	1	71.8	79.3	75.7
Not Selected		28.2	20.7	24.3
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You have not been called since you left primary school	2	12.6	9.8	11.1
Not Selected		87.4	90.2	88.9
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You think that you are no longer entitled to free dental	3	1.9	0.0	1.1
Not Selected		98.1	100.0	98.9
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
You could not get an appointment	4	4.9	4.9	4.8
Not Selected		95.2	95.1	95.2
Total		100.0	100.0	100.0
		NO MC (%)	MC (%)	Total (%)
Other reason (please tick and write in below)	5	12.6	8.5	10.6
Not Selected		87.4	91.5	89.4
Total		100.0	100.0	100.0

Q13. In the last 6 months, have you ever had a sleepless night because you were awake with toothache?				
		NO MC (%)	MC (%)	Total (%)
Yes	1	6.7	15.1	9.5
No	2	93.3	85.0	90.5
Total		100.0	100.0	100.0

Q14. In the last 6 months, have you ever missed school because of tooth-				
		NO MC (%)	MC (%)	Total (%)
Yes	1	3.0	7.3	4.3
No	2	97.0	92.7	95.7
Total		100.0	100.0	100.0

Q15. Which type of dental service have you mainly used in the past?				
		NO MC (%)	MC (%)	Total (%)
Family dentist	1	78.8	74.9	77.5
Community dentist	2	19.7	22.7	20.7
School of dentistry	3	0.5	0.5	0.5
Don't Remember/Never been to the dentist	4	1.0	1.9	1.3
Total		100.0	100.0	100.0

Q16. The last time you were waiting at the dentist for your turn in the chair, how did you feel?				
		NO MC (%)	MC (%)	Total (%)
Relaxed	1	51.4	56.4	53.5
A little worried	2	38.2	32.4	36.1
Frightened	3	6.7	5.4	6.1
So frightened I felt sick	4	3.6	4.9	4.0
Cannot remember/ I have never attended the dentist	5	0.0	1.0	0.3
Total		100.0	100.0	100.0

Q17. How many children are in your family including yourself?				
		NO MC (%)	MC (%)	Total (%)
One Child	1	6.3	7.5	6.5
Two Children	2	27.2	18.1	24.2
Three Children	3	29.3	21.1	26.9
Four or more children	4	37.2	53.3	42.5
Total		100.0	100.0	100.0

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