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The Dental Health of Pre-school Children with Disabilities in the Republic of Ireland

Oral Health Services Research in the Provision of a Dedicated Dental Health Prevention Programme for Pre-school Children with Disabilities

A Thesis Submitted for the Degree of
Doctor of Philosophy (Ph.D.)

Darius Sagheri
Division of Special Care Dentistry
Public and Child Dental Health
Dublin Dental School and Hospital

School of Dental Science
Trinity College
University of Dublin
2010

DECLARATION

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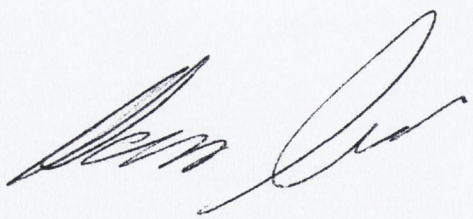

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Darius Sagheri

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Dean of the School of Dental Science,
Trinity College, Dublin

Dr. Janine Owens
Lecturer
Department of Oral Health and Development
School of Clinical Dentistry
University of Sheffield

Dr. Jacinta McLoughlin
Senior Lecturer
Division of Public Dental Health
Public and Child Dental Health
School of Dental Science
Trinity College, Dublin

Dr. Alan Kelly
Senior Lecturer
Small Area Health Research Unit
Department of Public Health and Primary Care
School of Medicine
Trinity College, Dublin

Garry Donnelly
Research Associate
Division of Special Care Dentistry
Public and Child Dental Health
School of Dental Science
Trinity College, Dublin

SUMMARY

Objectives:

The aim of the present study was to examine the dental health status of pre-school children with disabilities in the Republic of Ireland. The objectives of this study were to record the dental health status of a sample group of pre-school children with disabilities in the North-East (NE), who received an dental health prevention programme (intervention group) and a compatible group in the South-East (SE), where such a programme was not available (control group) by clinical examination of dental caries experience (dmft), oral hygiene, developmental defects of enamel (DDE), dental erosion, dental trauma and diagnosis of impairment / medical problem; to collect data on dental health knowledge, behaviour and attitude of caregivers by use of a questionnaire; to record changes in these dental health indicators over a three-year period. Additional objectives were to demonstrate the feasability of developing and using a secure mobile, online data collection system; to describe and interpret caregivers view of their children's dental health care needs, parental coping strategies and their view of barriers to participation in this study as well as access to dental services by use of qualitative research techniques.

Material and Methods:

A team of trained and calibrated dentists examined the children's dental health status under standardised conditions. Prior to the clinical examination, caregivers were interviewed on dental health knowledge, behaviour and attitudes by use of a questionnaire. All data were captured electronically with a secure, online data collection system. Qualitative methodology was used as a framework to guide the research on caregivers views. Individual interviews and self-selecting focus groups were used to gather qualitative data.

Results:

Of a total of 422 participants, 346 datasets were included in the present study. Out of these 346 children, 196 were examined in the NE region and 150 children were examined in the SE region. Of these 346 examined children, approximately 63% had a cognitive disability, 10.1% had a physical disability, 11.6% had a cognitive disability and were additionally medically compromised, 3.2% were medically compromised and in 12.1% of the children, a diagnosis had not yet been established. The clinical examination demonstrated that dental caries was detected from the age of four-years in both regions. In the NE region the mean

dmft was 0.37 (SD 1.277) and in the SE region it was 0.65 (SD 1.546) at the first examination. Longitudinal analysis of the data revealed no change in dental caries prevalence in the NE region (intervention group) and a statistically significant increase (p=0.023) in the SE region (control group) when compared to the second examination. Assessment of the oral hygiene status revealed that the number of children considered to have excellent oral hygiene was higher in the SE region (53.3%) when compared with the NE region (37.8%) at the first examination, and these results did not change significantly over the observation period. Analysis of the prevalence of visual changes in the appearance of enamel demonstrated that approximately 71.7% of all children examined had a normal appearance of the enamel (DDE=0) at the first examination.

Discussion:

The present study demonstrated that dental caries was not detected in pre-school children with disabilities in the first three years of their lives. Comparison of the present results with the findings from the last national dental health survey revealed that dental caries prevalence in five-year olds with disabilities was lower when compared with the general child population. The oral hygiene assessment revealed a regional variation, which did not change noticeably, despite provision of an dental health prevention programme. No reference data for the prevalence of changes in the appearance of enamel in primary teeth is available in the Republic of Ireland, but the prevalence in permanent teeth is approximately 60% for normal enamel appearance (DDE=0), which indicates a low prevalence in the sample population.

Conclusions:

The evidence gathered indicates the need for a policy refinement, which should include the recommendation to use fluoridated toothpaste with a fluoride concentration of 1000/1100ppmF when the first teeth appear in the oral cavity. Parents of children with diagnosed disabilities who had an early referral and regular contact with dental services appeared satisfied with the provision of service. Not having a diagnosed disability meant parents struggled with access to services. A communication network incorporating parent support groups where parents could access information, and exchange experiences, coupled with the development of a parent/peer oral health care programme was suggested as being a useful way of enabling parents to make more effective decisions around their child's oral health.

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Chapter 1 Introduction

Oral health is an integral part of general health and significantly affects well-being and quality of life (Slavkin, 2001). Although the prevalence and severity of dental caries in the general population has fallen dramatically in developed countries in the past few decades, caries has remained a problem for a significant proportion of young children. It is now recognised that health behaviours adopted early in life can influence health in later life (Warren, 2001). Dental caries among pre-school children remains a significant dental public health problem, especially among socially disadvantaged groups in society (Watt et al., 2001). In Ireland, there are no national data on caries levels in pre-school children available. For children with special needs, studies have found that the prevalence of caries is similar to, if not less than, that of children without disability (Nunn, 2003). Therefore, the provision of baseline data on the dental health of pre-school children with disabilities can serve as a stepping-stone for planning appropriate oral health care programmes and questioning established patterns of clinical practice.

1.1 Demography of the Republic of Ireland

1.1.1 General Population

The population of the Republic of Ireland was 4,239,848 in 2006 (Table 1.1) (Central Statistics Office, 2006). Total fertility rates in Ireland have been declining for several decades, falling below replacement level for the first time in 1991 (Department of Health and Children, 1994a). However, in recent years, the population of the Republic of Ireland has been increasing more rapidly than at any time in the history of the State and in the past 10 years has increased by 15.7 percent. Much of this increase is due to the change from net emigration to net immigration. A key feature of Ireland's demographic change is the ageing of the population. This trend is being experienced across Europe. The numbers of people over the age of 65 will more than triple between now and 2050 compared with a projected overall population increase of around 35 percent. Life expectancy for both men and women has increased consistently in recent decades. The rise has been very rapid since 1999 and Ireland now exceeds the average life expectancy for the European Union (EU) (World Health Organization, 2009). Women can expect to live around five years longer than men (Central Statistics Office, 2006) although they experience more chronic health problems than men in

later years according to the EU Survey on Income and Living Conditions (EU-SILC) (Central Statistics Office, 2006).

Table 1.1: Population By Age Group In Ireland In 2006 (Central Statistics Office, 2006)

Age Group	Population
0-14 years	864,449
15-24 years	632,732
25-44 years	1,345,873
45-64 years	928,868
65 years and over	467,926
Total	4,239,848

1.1.2 Child Population

In 2007, there were 1,056,947 children under 18 years of age living in the Republic of Ireland (Table 1.2). Of these, 541,503 were boys and 515,444 were girls. In other words children under 18 accounted for almost one-quarter (24.4%) of the total population. Boys under 18 years of age accounted for approximately 24.9 percent of all males in the population and girls under the age of 18 accounted for approximately 23.8 percent of all females in the population.

Table 1.2: Population of Ireland Aged Less Than 18 Years In 2007 (Central Statistics Office, 2006)

Age	Boys	Girls	Total
<1 year	33,707	31,788	65,495
1 year	32,167	30,236	62,403
2 years	31,702	29,506	61,208
3 years	31,771	30,118	61,889
4 years	31,152	30,172	61,324
5 years	30,600	29,764	60,364
6 years	30,371	29,125	59,496
7 years	30,343	28,482	58,825
8 years	30,272	29,126	59,398
9 years	29,733	28,100	57,833
10 years	29,146	28,078	57,224
11 years	28,225	26,675	54,900
12 years	27,840	26,222	54,062
13 years	27,540	26,187	53,727
14 years	28,567	27,085	55,652
15 years	29,041	28,242	57,283
16 years	30,265	28,575	58,840
17 years	29,061	27,963	57,024
Total population	**541,503**	**515,444**	**1,056,947**

In order to put this into perspective, comparison with all other EU Member State (Table 1.3) demonstrates that Ireland had the highest proportion of children under 18 years of age (24.4%) of all EU Member States in 2007.

Table 1.3: Percentage Of Population Under 18 Years In EU27 By Country In 2007 (World Health Organization, 2009)

EU Member State	Percentage of children under 18 years	EU Member State	Percentage of children under 18 years
Ireland	24.4	Romania	19.5
France	22.4	EU 27 Average	19.4
Denmark	22.3	Estonia	19.3
Cyprus	22.2	Austria	19.2
Luxemburg	21.9	Hungary	18.9
Netherlands	21.8	Portugal	18.7
United Kingdom	21.5	Latvia	18.4
Sweden	21.2	Czech Republic	18.1
Malta	20.9	Spain	17.5
Finland	20.8	Slovenia	17.4
Belgium	20.7	Greece	17.4
Slovakia	20.5	Germany	17.3
Lithuania	20.5	Bulgaria	17.2
Poland	20.1	Italy	17.1

Census data showed, that in 2006 approximately 183,744 children under 18 years of age lived with a lone parent or guardian. This amounted to approximately 17.8 percent of all children living in the Republic of Ireland. Of these, approximately 27.6 percent (50,652) of children were aged 0-4 years; 26.6 percent (48,950) were aged 5-9 years; 17.3 percent (31,732) were aged 10-14 years; and the remaining 28.5 percent (52,410) were aged 15-17 years (Central Statistics Office, 2006).

As higher levels of parent educational attainment are considered to be associated with positive outcomes for children it is worth summarising census data on parental educational attainment as well. The 2006 Census distinguished between the following main categories:

1. No formal education or just primary education
2. Lower secondary education: Junior, Intermediate/Group Certificate, 'O' levels/GCSEs, NCVA Foundation Certificate, Basic Skills Training Certificate or equivalent
3. Upper secondary: Leaving Certificate, 'A' levels, NCVA Level 1 Certificate or equivalent, Technical or Vocational qualification, both Upper Secondary and Technical or Vocational qualification.
4. Third-level: Non-degree, primary degree, professional qualification (of Degree status at least), both a Degree and a Professional qualification, post-graduate Certificate or Diploma, post-graduate Degree (Masters) or Doctorate (PhD).

Approximately 30.6 percent of children under 18 lived in families where the mother had a third-level degree or higher educational attainment. This percentage varied from 38.7 percent for households with children aged 0-4 years to 22.8 percent for households with children aged 15-17 years. Approximately 52.8 percent of children under 18 years of age lived in families where the highest level of

educational attainment by mothers was a lower secondary or upper secondary education. And approximately 6.3 percent of children lived in families where the mother had either no formal education or primary education only.

1.1.3 Child Population with Disabilities

Information on the child population with disabilities is collected on two databases administered by the Health Research Board's Disability Databases Unit on behalf of the Department of Health and Children.

The National Intellectual Disability Database (NIDD) was established in 1995 to provide information for decision-making in relation to the planning, funding and management of services for people with an intellectual disability. Currently, there is approximately 95 percent coverage on the NIDD database. In 2007, the number of children aged under 18 registered as having an intellectual disability was 7,802 (Table 1.4).

Table 1.4: Number Of Children Registered As Having An Intellectual Disability Between 2003 To 2007 (Kelly et al. 2008)

Year	2003	2004	2005	2006	2007
No of Children	7,365	7,504	7,385	7,658	7,802

In 2007, 36.8 percent (2,870) of those registered on the NIDD were identified as having a mild disability; 27.4 percent (2,134) as having a moderate disability; 9.5 percent (740) as having a severe disability; and 1.9 percent (147) as having a profound disability. The remaining 24.5 percent (1,911) were not verified (i.e. they did not have their level of intellectual disability confirmed). Table 1.5 gives a detailed breakdown on the distribution of the different levels of intellectual disability for each age-group.

Table 1.5: Number Of Children Registered As Having An Intellectual Disability By Age In 2007 (Kelly et al., 2008)

Age	**Mild**	**Moderate**	**Severe**	**Profound**	**Not verified**	**Total**
0-4 years	73	69	19	6	904	1,071
5-9 years	751	605	260	50	802	2,468
10-14 years	1,113	895	304	56	151	2,519
15-17 years	933	565	157	35	54	1,744
Total	2,870	2,134	740	147	1,911	7,802

The National Physical and Sensory Disability Database (NPSDD) was piloted in 2000/2001 and national implementation began in 2002 to provide a comprehensive and accurate information base for decision-making in relation to the planning, funding and management of services for people with a physical

and/or sensory disability. Currently, there is approximately 65 percent coverage on the NPSDD database.

In 2008, the number of children registered as having a physical and/or sensory disability was 8,223 (Table 1.6). Of these approximately 62.2 percent (5,115) were boys and 37.8 percent (3,108) were girls. A detailed age breakdown of the distribution of children registered as having a physical and/or sensory disability showed that approximately 8.0 percent (657) were 0-4 years old; 36.6 percent (3,010) were aged 5-9 years; 38.4 percent (3,159) were aged 10-14 years; and 17.0 percent (1,397) were aged 15-17 years.

Table 1.6: Number Of Children Registered As Having A Physical And/Or Sensory Disability By Age And Gender In 2008 (Doyle et al., 2009)

	Boys	Girls	0-4 years	5-9 years	10-14 years	15-17 years	Total No. (%)
Physical	3,398	2,065	329	1,821	2,297	1,016	5,463 (65.2)
Hearing loss/deafness	213	212	18	99	182	126	425 (5.1)
Visual	113	120	19	60	83	71	233 (2.8)
Physical and hearing loss/deafness	107	59	11	63	63	29	166 (2.0)
Physical and visual	97	73	21	55	52	42	170 (2.0)
Hearing loss/deafness and visual	5	12	0	4	9	4	17 (0.2)
Physical, hearing loss/ deafness and visual	21	19	0	16	19	5	40 (0.5)
'Primary Speech and Language'	794	327	147	638	289	47	1121 (13.4)
'Physical and Primary Speech and Language'	288	167	87	184	137	47	455 (5.4)
'Hearing and Primary Speech and Language'	65	46	23	54	24	10	111 (1.3)
'Visual and Primary Speech and Language'	14	8	2	16	4	0	22 (0.3)

Participation in these databases is voluntary and only includes those in receipt of, or requiring, specialised disability services; therefore, they may not include all people living in Ireland who have a physical and/or sensory disability or an intellectual disability. In general, where people with profound, severe or moderate intellectual disabilities also have physical or sensory disabilities, they are more appropriately registered on the NIDD and consequently are not included on the NPSDD.

1.2 The Irish Health Care System: An Overview

1.2.1 Institutional Structures and Resources

The public health care system of the Republic of Ireland is governed by the Health Act 2004, which established a new body to be responsible for providing health and personal social services to everyone living in Ireland - the Health Service Executive (HSE). The re-structured national health service came into being

officially on 1 January 2005 and the re-organisation is still on going. In addition to the public sector, there is also a large private healthcare market.

The publically funded HSE is responsible for the provision of health and personal social services for everyone living in Ireland. It replaced the ten regional Health Boards, the Eastern Regional Health Authority and a number of other different agencies and organisations. The Minister for Health and Children has overall responsibility for the executive in government. The HSE is Ireland's largest employer with over 100,000 employees and has an annual budget of approximately €16 billion, more than any other public sector organisation. The HSE's organisational structure is divided into three main areas:

Health, Personal and Social Care Services, which in turn is divided into three service delivery units:

- The National Hospitals Office (NHO), which manages acute hospital and the HSE National Ambulance Service (1);
- Primary, Community and Continuing Care (PCCC), which delivers health and personal social services in the community and other settings (2);
- Population Health, which promotes and protects the health of the entire population (3);
- Support Services, which enables the HSE to function efficiently and cost effectively;
- Reform and Innovation, which drives the HSE's strategic and corporate planning process.

In addition, various other advisory executive agencies and voluntary organisations have a role to play in service delivery and development in the health system. The HSE funds voluntary/community organisations to provide services on their behalf.

Access to the state funded health service is based on a means-tested system of eligibility comprising two categories. People whose income falls below a certain threshold fall into Category I and are entitled to a wide range of free services and are issued a 'Medical Card'. The income guidelines vary according to age and whether the person lives alone, with spouse / partner, or with family. The HSE has a number of standardised procedures for applying the guidelines. There is no legally fixed definition of undue hardship. For example, Medical Cards are usually granted to children in foster care or recipients of disability allowance. The income guidelines for Medical Card eligibility are revised annually in line with changes in the Consumer Price Index. A medical card is usually issued for a year, after which

it is reviewed. At the end of December 2009 this group constituted approximately 33 percent of the population (Health Service Executive, 2010). The remainder of the population has limited eligibility and is classified as Category II. This eligibility structure forms a central feature of the Irish health care system. Category I status is essentially designed to meet the needs of people who are unable, without undue financial hardship, to arrange general practitioner medical and surgical services plus dental, optometry and aural services for themselves and their dependants. Entitlements under category I can be summarized as follows:

- GP services;
- All inpatient hospital services (including consultant care) in public wards;
- Specialist services in outpatient clinics;
- Dental, ophthalmic and aural services;
- Supply of prescription drugs, medicines, medical and surgical appliances;
- Maternity care and infant welfare services;
- Some personal and social care services, for example, public health nursing, social work services and other community care services.

Furthermore, Medical Card holders are exempt from paying the 'Health Levy' part of social insurance and from the 'Income Levy' introduced in 2009. They may also be exempt from paying school transport charges, state examination fees in publicly funded second-level schools. There may also be financial help with buying schoolbooks in certain schools.

General practitioners (GPs) provide medical services to Medical Card holders free of charge at the point of delivery. Those GPs, who participate in the *General Medical Services (GMS)* scheme, enter into contracts with the HSE to provide services. Patients may generally choose their doctor from a panel of doctors who are part of the scheme, provided the doctor is willing to have them as patients. Doctors must treat Medical Card patients in the same way as they treat private patients. Approved prescribed drugs and medicines are free of charge for Medical Card holders, but a 50 cent levy on each item on a prescription up to a maximum of €10 per month for each family will be charged. Under the *Drugs Payment Scheme*, no person or family unit should have to pay more than 100 euro per calendar month for approved prescribed drugs and medicines.

Those without a Medical Card or private health insurance and their dependants are able to receive medical services for free or at a subsidised rate from the

Treatment Benefit Scheme, which brings into account the compulsory *Social Insurance Fund (Pay Related Social Insurance, PRSI)* contributions they have made. PRSI is made up of a current account and an investment account managed by the Minister for Social and Family Affairs and the Minister for Finance, respectively. The current account consists of monies collected from people in employment. This money is then used to fund social insurance payments. In addition, employees pay a health levy (also called a health contribution), which is charged on all income. The health levy is not paid into the Social Insurance Fund. The health levy is collected from income and paid to the Department of Health and Children to fund health services in Ireland.

Furthermore, people can also claim tax-relief on some medical expenses that are not covered by the State or by private health insurance. Those with private health insurance also get tax credits, which are passed directly on to the insurance company and lower the customer's premium. These private insurances covered approximately 51.6 percent of the population at the end of the year 2008 (Health Insurance Authority, 2009). They pay the contribution for care in the public health service system (e.g. for hospital services) required of patients who do not hold medical cards, and provide for services that are not available to these people in the public service.

1.2.2 Health Expenditure in the Republic of Ireland

Total expenditure on health is the amount spent on health care goods and services plus capital investment in health care infrastructure. This includes outlays by both public and private sources (including households) on medical services provided by hospitals, nursing homes, outpatient facilities, ambulance services, home health care providers, laboratories, pharmacies and other retailers of therapeutic goods. Also included are outlays on public health and prevention programmes and administration. Excluded are health-related expenditure such as training, research, environmental health programmes and water and sanitation projects. Ireland spent 7.5 percent of its GDP on health in 2007 according to the Organisation for Economic Co-operation and development (OECD) (2009), which is almost 1½ percentage points lower than the average of 8.9 percent across OECD member countries. Health spending per capita in Ireland grew, in real terms, by an average of 6.4 percent per year between 2000 and 2007. This was the third fastest growth rate of all OECD countries during this period and

significantly higher than the OECD average of 3.7 percent per year. In Ireland, 80.7 percent of health spending was funded by government revenues in 2007, which above the OECD average of 73 percent. Despite increasing numbers of doctors in recent years, Ireland continues to have a lower number of physicians per capita than in many other OECD countries. In 2007, Ireland had three physicians per 1,000 population, compared with an OECD average of 3.1 (OECD, 2009).

Table 1.7 gives a detailed breakdown of estimated non-capital expenditure on each of the health programmes for the years 2008 to 2009 (Department of Health and Children, 2010). The dental service is part of the public health services programme. Details about services and treatments provided by the dental service as part of the public health service can be found in section 1.2.5.

Table 1.7: Estimated Non-capital Expenditure On Each Of The Health Programmes For The Years 2009 and 2010 (Department of Health and Children, 2010)

Programme	2009 € million	Outturn 2009 € million	2010 € million	% Change on Outturn
Policy and Corporate Support	236	188	193	3
Children, Young People and Families	1129	1099	1014	-8
Primary Care	4233	4218	4064	-4
Acute Hospitals (including Cancer Control)	5670	5908	5695	-4
Disability	1618	1564	1508	-4
Mental Health	1076	1058	1056	0
Care of Older People	2005	1958	1794	-8
Total Gross Programme Expenditure	15,957	15,993	15,324	-4

According to the EU Manual of Dental Practice, Ireland spent 0.33 percent of its GDP on oral health care in 2008 (Council of European Dentists, 2008). Of these, approximately 60 percent of all oral health expenditure was provided from private, i.e. non-state funded sources (Council of European Chief Dental Officers, 2009).

1.2.3 Dental Services in the Republic of Ireland

In 2008 there were 2,578 registered dentists in Ireland (Table 1.8), of whom 33 percent were female (Council of European Dentists, 2008). It was estimated that 1,990 were actively working. There were no reports of unemployed dentists. The population per active dentist was 2,221 (Council of European Dentists, 2008). Dentists in Ireland are registered by the 'Dental Council of Ireland' and work under its code of professional behaviour and dental ethics. In 2008 there were 338 dental hygienists in Ireland, registered also by the Dental Council. Dental hygienists work under the supervision of a dentist who prescribes the treatment plan and is

responsible for the treatment. The dental hygienist works with procedures aimed to prevent and / or control dental caries and periodontal diseases. The dental hygienist teaches patients how to practice good oral hygiene, applies preventive materials such as fluorides and sealants to the teeth, counsels patients regarding good nutrition and its impact on oral health and carries out dental treatments such as scaling and polishing of teeth. The dental hygienist plans, implements and evaluates dental health in promotional and educational activities for groups and individuals. Table 1.8 gives a breakdown of the number of dentists working in different settings in Ireland in 2008 (Council of European Dentists, 2008).

Table 1.8: Breakdown Of Number Of Dentists Working In Different Settings In Ireland In 2008 (Council of European Dentists, 2008)

Setting	Number of dentists
General (private) practice	1,400
Public dental service	360
Hospital	36
University (full-time)*	34
Armed Forces	8
Specialists/limited practice	148
Other (administrative etc.)	4

**about 95 General Practitioners also work part-time in Universities*

1.2.4 Oral Healthcare for Adults

The dentists in general practice provide most general dental care for adults. Patients with no state entitlement have their treatment carried out on a private basis at fees agreed between themselves and the dentist. At the outset of this project, there were two state schemes, which entitle adult patients to treatment by dentists in general practice, the *Dental Treatment Benefit Scheme (DTBS)* and the *Dental Treatment Services Scheme (DTSS)*.

Dental Treatment Benefit Scheme, DTBS (administered by the Department of Social and Family Affairs)

Employees, who make Pay Related Social Insurance (PRSI) contributions and their spouses are entitled to receive fully or partially subsidised dental care for a limited range of treatments. The Department of Social and Family Affairs run the DTBS centrally. In 2008 45 percent (Council of European Dentists, 2008) of adults were entitled to receive dental care under it. Examination and diagnosis, together with x-ray investigation, are free to the patient while the dentist reclaims the full (fixed) cost of these items from the Department of Social and Family Affairs. For other standard treatments there is a set fee, of which the patient pays a specified

portion. For more expensive treatments such as endodontics and prolonged periodontal treatment, the Department of Social and Family Affairs pays a set amount, while the patient pays the remainder of the fee agreed with the dentist. In 2008, 1441 dentists held a contract with the Department of Social and Family affairs to operate the DTBS. The number of people who used DTBS scheme based on number of claims received in 2007 was 648,682 (plus 43,138 dependant spouse claims). Dentists were paid a total of approximately € 69,42 million in 2008 for provided treatments under the DTBS up from € 64,85 million in 2007 (+7.1%) (Department of Social and Family Affairs, 2009).

Dental Treatment Services Scheme (DTSS) (administered by the HSE)

The Dental Treatment Services Scheme (DTSS) is a dental treatment service for adult medical card holders and was introduced in 1994, as part of the national *Dental Health Action Plan* (Department of Health and Children, 1994b). Whereas the dental care benefits from the Department of Social and Family Affairs (i.e. DTBS) are available on demand, dental care provided under the DTSS is budget-limited. Prior approval for treatment is required from the HSE for complete endodontic, prosthetic or periodontal treatment. Under the DTSS routine dental treatment has been made available to all adults (i.e. persons over 16 years) with medical cards. The service was delivered by 1,243 general dental practitioners to 258,167 persons (Table 1.9) out of approximately 1,276,178 eligible persons (30.10 percent of the population) throughout the country in 2007 (HSE Primary Care Reimbursement Service, 2008). The range of treatment items available includes examination, x-ray investigations, fillings, extractions, oral surgery, partial and full acrylic dentures, limited periodontal treatments and endodontics. Treatment is free to the patient and the dentist claims the full cost from the HSE Primary Care Reimbursement Service (PCRS). Dentists were paid a total of €58,19 million in 2007 in respect of treatments provided for 258,167 persons under the DTSS (HSE Primary Care Reimbursement Service, 2008).

Table 1.9: Volume Of Treatments By Dentists Under The DTSS In 2007 (HSE Primary Care Reimbursement Service, 2008)

	'Above the line'	'Below the line'	No. of persons treated
2007	€ 38.68 million	€ 19,46 million	258,167
2006	€ 36,29 million	€ 19,15 million	256,263

'Above the line' (ATL): uncomplicated routine treatments viz. Amalgam, Extractions
'Below the line' (BTL): advanced routine treatments viz. Prosthetics

1.2.5 Oral Healthcare for Children

Dental treatment for children is provided, in the public sector, by the HSE dental services, which is part of the Primary, Community and Continuing Care (PCCC) unit and delivered Local Health Offices, health centres and clinics at community level. Approximately 360 dentists, 30 hygienists and 450 dental nurses are employed by the HSE (Council of European Dentists, 2008; Department of Health and Children, 1999). The HSE has statutory responsibility for the dental treatment of pre-school children, national school children (5-12 years) and post-primary children less than 16 years. The Joint Working Group on the Delivery of Dental Services, which reported in 1988 ('Leyden report') (Department of Health and Children, 1988) recommended a *'clearly structured dental health service for eligible children and that the children are made dentally fit before they pass from the health board system.'* The Working Group acknowledged *'that a public dental service based on client demand rather than need does not serve those in greatest need'* and they concluded *'that self-referral is far from ideal as a method for the delivery of child dental services'* (Department of Health and Children, 1988). Eligible children obtain treatment directly from HSE dental surgeons. The HSE dental service employs all dentists as *Clinical Dental Surgeons Grade 1, General Dental Surgeons,* or *Senior Dental Surgeons* with special skills in various specific disciplines. *Principal Dental Surgeons* also have administrative and management responsibilities. A planned systematic approach to the delivery of services has been adopted. The service is based on the needs of the child population rather on their demands. The advantage of a needs-based system is that services can be planned in an ordered fashion, precise targets can be set and evaluated and the uncertainty of demand is eliminated. Children, who may never demand a service and these are often in the lower socio-economic groups and in greatest need of dental care, are in a needs-based system screened and advised of the service available and referred for care. The most appropriate method of screening children is in schools. Priority had been given to the prevention and treatment of disease in

permanent teeth. In order to gain access to the permanent teeth at risk (first permanent molars and second permanent molars) children at seven and twelve years of age receive priority for care. As the gap in services, which would obtain between ages seven and twelve, is wide, nine-year-old children are also screened and treated. The actual school classes, which include these age groups, are 2nd, 4th and 6th class. Children in national schools in 2nd, 4th and 6th class are systematically targeted and screened on a regular basis and provided with preventive and other necessary care as required (Department of Health and Children, 1999). Children who do not avail of the public dental service for either routine care or orthodontic treatment can go to the private dental practitioners or orthodontist for their treatment. In these cases, parents must pay the full cost care at fees agreed with the practitioner. The Joint Working Group on the Delivery of Dental Services (Department of Health and Children, 1988) recommended that prevention of dental disease must be promoted, not only in the interest of the well-being of the community, but also as a practical economic measure to contain the treatment load within limits which the community can reasonably afford. The Working Group argued that priority must be given to the development of preventive services and the adoption of a philosophy of prevention and stressed that while the provision of treatment and restorative services for eligible persons must remain a function of the health board dental services, it can only succeed within a framework of prevention. Preventive measures in dentistry have long been established in Ireland. Water fluoridation was introduced in the Dublin area in 1964 in accordance with the Health (Fluoridation of Water Supplies) Act 1960 (Government of Ireland, 1960). It was the first area to be fluoridated in the country. At present approximately 72 percent of the total population of Ireland receive fluoridated water. Persons in non-fluoridated areas reside mainly in rural communities with small local or individual water supplies. The local authority, responsible for the provision of water, fluoridates the water on behalf of the HSE at the water treatment plants. The cost of fluoridation, including the provision of plant and equipment and the ongoing fluoridation is initially borne by the local authority but is subsequently recouped in full from the HSE. The fluoridation programme is a cornerstone of the HSE preventive dental health programme. Table 1.10 gives an overview on the structure of the statutory oral health care services for children and adolescents in the Republic of Ireland.

Table 1.10: Overview Of The Oral Health Care Services For Children And Adolescents In Ireland

	Child Population
Target population	Pre-school children, national school children (5-12 years) and post-primary children under 16 years
School examination intervals	Children in national schools in 2nd, 4th and 6th class are systematically targeted and screened. Parental consent has to be obtained for the school examination
School examination provider	School examinations are provided by HSE employed dentists (i.e. state employed and salaried)
Oral treatment provider	Oral care is delivered through HSE employed dentists on a salaried basis in HSE owned dental clinics (at HSE primary care centres)
Preventive treatments and their providers	Preventive measures such as: • Oral hygiene instruction; • Diet advice; • scaling and polishing of teeth; • Application of fissure sealant; • Application of topical fluoride. Are provided by HSE dentists and oral hygienists to patients on a needs basis
Population prevention strategy	Fluoridated Water

1.2.6 Oral Healthcare for Patients with Disabilities

The HSE provides a range of services for people with intellectual, physical and sensory disabilities, chronic medical condition, mental illness or are socially excluded. These services include basic health services as well as assessment, rehabilitation, income maintenance, community care and residential care. Some services are provided directly by the HSE. Many of the community, residential and rehabilitative training services are provided by voluntary organisations with grant aid from the HSE. The HSE has a statutory responsibility to provide dental services to this group of people. People with disabilities have the same dental needs as the rest of the population, but may have difficulties in accessing dental care. However, people with special needs should expect to receive similar oral and dental care to people without disabilities, although the facilities needed to provide that care might not be generally available. Therefore, preventing dental disease is the most important aspect of oral and dental care, since the need for more invasive dental treatment may often be avoided. Patients with special needs should be seen as often as their oral and dental condition dictates. Dental care for patients with disabilities is currently available on demand whereas all other dental services provided by the HSE dental service are needs based services. Children with special needs attending ordinary classes in mainstream schools, in special classes in mainstream schools or in special schools are systematically targeted and screened on a regular basis and provided with preventive and other

necessary care as required. Furthermore, patients with disabilities attending specific care centres or hospitals may be screened on a regular basis and provided with necessary care as well. If a patient cannot co-operate sufficiently for routine dental care, either because their understanding is limited as a result of a significant learning disability, or they have a physical disability that results in uncontrolled movements, dental treatment may be offered with some sedation in a primary care or hospital setting or treatment may be offered under general anaesthesia, which requires referral to a hospital. However, facilities to provide dental care under general anaesthesia are limited and, because every general anaesthetic carries a risk, are only used when necessary. Specialist paediatric dental service is available after HSE referral for children with special needs at two of the three children's hospitals in Dublin, as well as from the paediatric dental departments at the dental schools in Cork and Dublin. In addition, people with hereditary coagulation defects, such as haemophilia, have a dedicated dental service provided at St James's Hospital, Dublin from the National Centre for Hereditary Coagulation Disorders.

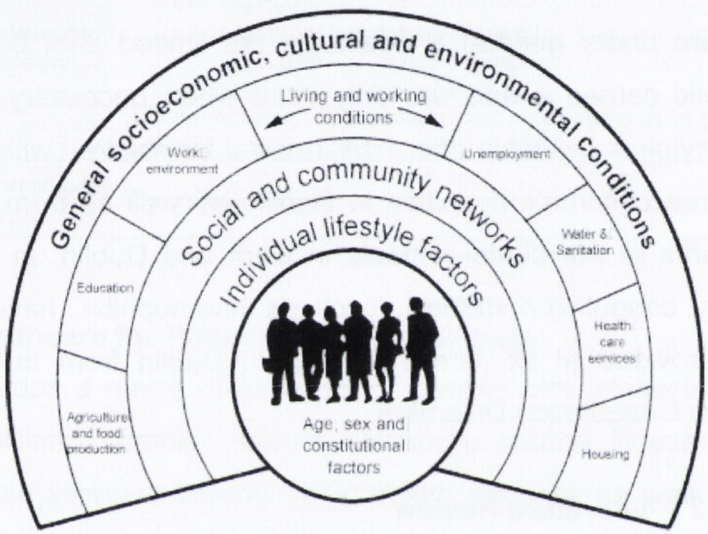
Chapter 2 Literature Review

2.1 Health and the Role of Dentistry

Schou and Locker (1998) considered the definition offered by the World Health Organization (WHO) in 1948 as a useful point of departure to understand the role that dentistry has to play in the health of societies. This defined health as 'a complete state of physical, mental and social well-being and not merely the absence of disease and infirmity'. While the health promotion approach lays great emphasis on this notion of well-being, most health service providers have been more concerned with the eradication of disease. In spite of its limitations, the WHO definition of health was a useful one, in that it began to clarify the essential distinction between disease and health. In this context, disease is a relatively narrow concept and may be taken to refer to pathological processes, which compromise the anatomical or physiological integrity of the body. Health refers to something much broader and is largely concerned with individuals' subjective experience of their body and their selves and its consequences in terms of the conduct of daily life. While disease belongs to the realm of biology, health belongs to the realm of sociology and psychology, encompassing as it does feelings, behaviours and the quality of life (Schou and Locker, 1998). The term social

determinants arose in the 1970s out of concern that much of the effort to improve health focused on the acute health care system in spite of research, which consistently demonstrated the huge impact on health of social circumstances and preventive services. Since then a body of public health research has increasingly demonstrated that people's health is remarkably sensitive to the wider social environment in which they live and work – the social determinants of health (Figure 2.1).

Figure 2.1: Determinants Of Health (Dahlgren and Whitehead, 1991)



According to Seeman (1989), the WHO definition of health recognises that the term 'physical, mental and social … conceptualise health according to a human-system framework which … invites a behavioural science-oriented approach to the study of health'. Furthermore, it emphasizes the idea that health goes beyond the realm of the individual to include social, ecological and economic facets of health. In terms of oral health, the focus is no longer just related to treating dental disease but to the whole constellation of factors, which influence and can prevent it (McGoldrick, 1998). For example, for a long time the main aim of organised dentistry has been the eradication of disease from the mouth and the replacement of teeth lost to disease and trauma. From the point of view of this contemporary definition of health, the aim should be to obtain and maintain a functional, pain-free, aesthetically and socially acceptable dentition for the lifespan of most people (Sheihan, 1992). Oral disease needs to be treated to the extent that it compromises this aim. A good example of the difference in the two approaches is given by tooth loss. While the traditional view emphasized the importance of replacing all missing teeth, research has shown that two complete dental arches

are not necessary for adequate function and aesthetics (Leake et al., 1994). That is, missing teeth may not have a negative impact on health and well-being and treatment is not warranted until they do (Schou and Locker, 1998).

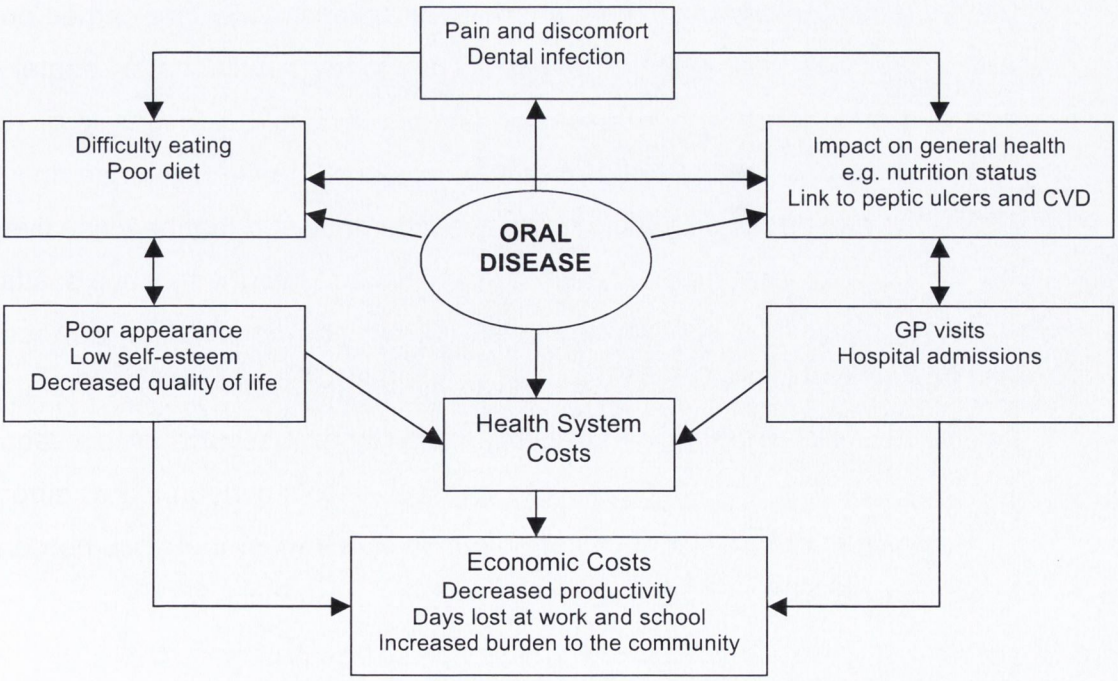
2.2 Oral Health and Well-being

Oral health may be defined as 'a standard of health of the oral and related tissues which enables an individual to eat, speak and socialise without active disease, discomfort and embarrassment and which contributes to general well-being' (Kay and Locker, 1997; Kay and Locker 1998). Good oral health is achieved when teeth and the oral environment are not only healthy but also:

- Comfortable and functional – food can be chewed thoroughly and without pain or discomfort and teeth not sensitive to stimuli such as cold;
- Social acceptability – no bad breath, appearance acceptable;
- Absence of sources of infection, which may affect general health (Department of Health and Children, 1999).

Oral disease has a substantial impact on the individual (Figure 2.2). The significant personal burden of oral disease due to the associated pain and discomfort may result in difficulty eating and a poor diet, which consequently affect appearance, self-esteem and quality of life (Dental Health Foundation, 2001).

Figure 2.2: Impact Of Oral Disease On The Individual (Department of Human Services, 2000)



2.3 Health and Oral Health Behaviour

2.3.1 Definition of Health and Oral Health Behaviour

McGoldrick (1998) concluded that the meaning of health behaviour has until recently followed a similar route to the meaning of health, in that it began its existence as a biological and disease model rather than a psychosocial model (Anderson et al., 1988). Nowadays emphasis in construing health behaviours has shifted to an understanding of the many social, cultural, economic, long-standing belief and attitudinal factors, which affect them. Steptoe and co-workers (1994) developed a working definition of health behaviour, which defines health behaviour as 'activities undertaken by people in order to protect, promote or maintain health and to prevent disease'. There are many realms of behaviours, but in a health context the realms of behaviour, which are the most relevant, are those that relate to the risk of developing disease or health problems (Baranowski, 1990). Dental health behaviours have been categorized, for example, according to 'brushing behaviour', 'complex dental behaviour' and 'sugar behaviour' (Rise and Holund, 1990). Health-related behaviour change will reduce unhealthy behaviours such as sugar in the diet, as well as increase healthy behaviours such as flossing and dental attendance (Prochaska, 1994). Many general health factors are of direct relevance to oral health, e.g. smoking, diabetes, alcohol, stress or medication (Horowitz, 1990). A distinction is made between health-related behaviours and health-directed behaviours. The latter refer to 'actions, which are carried out in the belief that they will benefit health'. The former may have dental health consequences but are undertaken for non-dental health reasons, e.g. reducing sugar in the diet to lose weight rather than for dental health (Freeman and Linden, 1995). One must recognise that people live differently and that how one lives, what one thinks, and how one behaves are crucial in determining one's attitude to health and one's susceptibility to illness. Green and Johnson (1983) suggested that 'health behaviour and response to health education are correlated with specific beliefs concerning personal susceptibility and severity of consequences, the efficacy of recommended practices and with beliefs concerning whether health is an outcome under a person's control'. Individuals must therefore be convinced of their susceptibility to illness and of their ability to influence it.

2.3.2 Influencing Factors of Health & Oral Health Behaviour

According to Petersen (1998), the process of socialisation enables us to take part in group life and to acquire many of the characteristics we think of as human. Socialisation takes place within groups. Early or primary socialisation usually occurs exclusively within small intimate groups. The principal example of this type of group – known as the primary group – is the family. Later humans enter groups that tend to be larger and more impersonal. The secondary groups, important in the process of secondary socialisation, range from the primary schools to larger work-related groups, continuing to old-age homes. Interactionism is the sociological position, which stresses the importance of socialisation to the study of social behaviour. Groups are used to evaluate ourselves and to acquire attitudes, beliefs, values and norms. Groups used in this way are reference groups, but we need not to be necessarily a member of a reference group. Those whose judgements are most important to our self-concept are called significant others. For a child, significant others are likely to include mother, father, teachers and friends. Teenagers place heavy reliance on their peers. The importance of family support in the development of appropriate dental health care habits of children and adolescents has been shown in several studies. Gratrix et al. (1990) demonstrated that dental care habits and dental health status of children improved when their mothers undertook regular dental care themselves. Pine et al. (2000) investigated through the Health Belief Model, how parents' beliefs influence the likelihood of their 5-year-old children brushing twice a day. The most significant parental belief explaining variation in twice-daily brushing was whether parents feel strongly that there is time to check their child's toothbrushing. The odds of these parents reporting that their child brushes twice daily are nearly three times greater. Ninety five percent of participating parents felt that toothbrushing charts would be a good way for dentists in practice to encourage children to brush regularly. Pine and co-workers (2000) concluded that parents' beliefs do influence the likelihood of their children brushing twice a day. Astrom and Jakobsen (1996) investigate the effect of parental dental health behaviour on their adolescent offspring. The data comprised separate questionnaires for both parents and child. The results showed that there were statistically significant associations of use of dental floss, tooth brushing, and drinking of non-sugared mineral water among parents and their adolescent offspring. These findings indicate that parents function as social models for their offspring well into the adolescent period with regard to several

dental health behaviours. Positive dental health attitudes in parents and emotional support to children are considered important to 'dental socialization', but equally important is the practical help from parents. In addition, research provided evidence to support the assumption that the family servers as a major influencing agent on health behaviour (Rossow, 1993). The potential for parental influence on adolescents health behaviour was found to be greater if both parents were consistent in their behaviours and the influence of parents was present throughout the late period of adolescence.

2.4 Health and Sociology

2.4.1 Sociological Perspective on Health

In order to better appreciate human interaction and its influence on health behaviour and how this can be changed, it is worthwhile having an insight into how an individuals' behaviour may depend on its social and wider environment. Petersen (1998) defined sociology as the study of human groups. The discipline focuses on two interrelated areas of study: social factors and recurrent relationships among people. Sociology is not concerned with behaviour unique to individuals or with particular situations. These lie outside the boundaries of the sociological perspective since sociologists are interested in patterned human relationships rather than individual behaviour. This approach assumes that the behaviour within a group is not primarily determined by the characteristics of its individual members. The sum of a group is not equal to its parts. Something new is created when individuals come together as a collective, originally emphasized in 1895 by one of the classic sociologists, Emile Durkheim (Durkheim, 1966). Durkheim argued that individualistic explanations of group behaviour are inadequate because all human activities are influenced by social forces, which individuals have not created themselves and therefore cannot control. We live in groups ranging in size from a family to an entire society, but they all encourage conformity. People who belong to similar groups tend to think, feel and behave in similar ways. Such patterns may form the basis of culture, norms and traditions. Group members also tend to conform even when their personal preferences are not the same as their groups. This is due to social or peer pressures. Whether it is because members value their groups' ways or because they yield to the social pressures of the moment, behaviour within a group is not usually predictable from knowledge about its individual members (Petersen, 1998).

2.4.2 Conceptual Traditions to Describe Societies

Few themes have been as central to the social sciences as the conceptualisation and study of inequality and the distribution of social and economic resources since the inception of sociology as a discipline by August Comte, and Marx's outline of the exploitative nature of class relations. Based in part on empirical evidence and in part on custom, most contemporary approaches to stratification and mobility within modern complex societies emphasize professional occupational titles as the primary defining criterion of social position. Conceptualisation and measurement of social stratification is one of the best established, most complex, and most disputed areas in the social sciences. The most basic divergence to describe societies can be traced back to the nineteenth-century. Two main traditions can be distinguished: one describing societies and mobility as occurring within a class structure, and the other as occurring within some form of social hierarchy. The Marxist tradition refers to the movement of individuals as between social positions, identified in terms of relationships within labour markets and production units. The Weberian tradition refers to the movement of individuals as between social groupings or aggregates, ranked according to such criteria as their members' prestige, status and economic resources.

2.4.3 Social Stratification

Jones (1994) described social stratification as structured inequalities that exist between different groups of people in a given society. In geology, strata are layers of deposits, as in rock formations, and this notion highlights a main assumption in theories of stratification: namely that some groups in society are higher up the social scale than others. Although dislocations and eruptions in strata may occur (as people move up or down the social scale) there always exist identifiable social layers. Within these social layers people will have features in common, such as income levels, cultural traditions and social values, which will differentiate them from other strata; these features, and the strata themselves, will tend to persist across the generations. However, this social patterning and layering is always subject to stress and change, which can modify and transform the relationship between the strata. Stratification implies that groups are in an unequal relationship with other groups; some are more powerful, others less. Thus, some degree of structured social inequality is a major feature of such a system. This inequality might be of a material nature, and here we might think of income, housing or

health changes. 'Class' is the form of stratification, which has been most pervasive in industrialised societies. A class system is based primarily on income differences between groups: that is, groups have unequal access to and control over possessions and material resources, and members of each class have similar levels of resources (Jones, 1994).

2.4.4 Consequences of Stratification

Petersen (1998) argued that the three umbrella-like dimensions of class-related social repercussions are life chances, lifestyle and personality. Life chances refer to the likelihood of possessing the good things in life. Such living conditions include health, happiness, education, wealth and legal protection. The probability of acquiring and maintaining the material and non-material rewards increases with social class level, whereas life expectancy declines with social class level. Whether measured by the death rate or by life expectancy, the likelihood of a longer life is enhanced as people move up the stratification structure. This disparity in the most fundamental of life chances may be due to differences in living conditions, the value placed on medical attention, concern with proper nutrition, attention to personal hygiene and the ability to afford what these things cost. Therefore, it is not surprising that physical health is affected by social class position (Whitehead, 1999). Those lower in a stratification structure are more likely to be sick or disabled and to receive poorer medical treatment once they are ill. Life chances are often linked to the economics of social class. Since life chances can be improved with access to wealth, they can be changed quickly. Lifestyle, on the other hand, changes less easily because this is related to culture. Research has shown that the rich and the poor are separated by much more than just money (Acheson, 1998; Whitehead, 1999). Social class differences have been observed in many areas of life, including language, marital and family relations, child rearing, political attitudes and behaviour, religious affiliation and participation in social activities. Just as life chances and lifestyles are correlates of stratification structure, social class is associated with different personality characteristics. This occurs because the patterns of socialization vary from social class to social class. This is not to say that all members of a social class share a given personality trait. It does mean that, as whole, members of one social class exhibit a given characteristic more than members of another class do (Acheson, 1998; Whitehead, 1999).

2.4.5 The Concept of Deprivation

Deprivation is a concept that has taken a variety of forms and has had many different meanings that have evolved over time. The compilation of different measures of deprivation has been pursued in the UK since the early 1980s and a number of indices have been put forward, for example by Townsend, Carstairs and Morris, Department of Environment Transport and the Regions and Jarman. There are many different measures of deprivation in common use. The Townsend Score and the Carstairs Score were both developed as measures of material deprivation. The Jarman Underprivileged Area Score was not originally constructed to measure deprivation but as a measure of General Practice workload. The series of indices that have been produced by the (former) UK Department of the Environment (DoE) and the Department of Environment, Transport and the Regions were designed as general measures used to identify areas of greatest need in order to assist central government when allocating resources to Local Authorities. Kelly and Sinclair (1997) pointed out the importance in developing a deprivation index is to distinguish between those groups *presently experiencing* deprivation and those who *may be at risk* of deprivation. There has been a tendency in the past to include socio-demographic categories like elderly living alone, single parenthood, or large families, as part of the definition of deprivation. Certainly, some members of these groups may be deprived, but many are not, and a deprivation index including these categories is invalid. However, such socio-demographic categories are still very much of interest to public health planners, and this interest may be separately addressed in a specific 'at-risk' index. There is also the danger of 'trawling' for variables for inclusion in a deprivation index without due regard being paid to the overall rationale for their selection. This can often result in subtle forms of double-counting and high inter-indicator correlations. Deprivation can be defined as a state of 'observable and demonstrable disadvantage relative to the local community to which an individual belongs' (Townsend, 1987). Arising from this broad definition is the concept of *material* deprivation, which entails the lack of goods, services, resources, amenities, and physical environment, which are customary, or at least widely approved of in society (Kelly and Sinclair, 1997).

2.4.6 Material Deprivation Index for Ireland

The Small Area Health Research Unit (SAHRU) Deprivation Index is a composite of four indicators, which are widely believed to represent or be a determinant of material disadvantage: unemployment, low social class, lack of a car and living in rented accommodation. Unemployment reflects lack of access to earned income and the facilities of employment. Being in a low social class - i.e. semi-skilled and unskilled manual occupations (including farmers farming less than 30 acres) - reflects earnings at the lower end of the income scale. Low income limits access to material resources and the ability to make choices in life. Car ownership has been suggested as a surrogate for current income. Non-owner occupation reflects lack of wealth in the long term as well as current income. Appendix G provides a detailed discription of these four census based indicators. Each of the indicators was first standardised and then subjected to *principal components* analysis to determine the appropriate weighting each variable is assigned. The index is constituted by the first principal component, if this adequately captures most of the total variation in the data. The 1st principal component provides a score for each electoral divisions (EDs) that is the basis for the index. The scale (or principal component score) is ranked from low (least deprived) to high (most deprived) and then simply divided into 10 classes or deciles. The last decile therefore comprises the most deprived EDs in the country. There are nearly three and a half thousand EDs in the Republic of Ireland, however, the Central Statistics Office (CSO) does not release small area population statistics (SAPS) on some sparsely populated EDs for reasons of confidentiality. These latter EDs are generally merged with neighbouring EDs. As a result, in 2006 the SAPS were made available on 3409 EDs. The SAHRU Deprivation Index is very similar to that developed by Townsend (1987) and Carstairs and Morris (1991) in the UK, but has been suitably adapted for Ireland (Kelly and Sinclair, 1997, 2007).

2.4.7 General Health and Material Deprivation

There is a significant relationship between health and socio-economic status. Several comprehensive investigations on this issue have been conducted in the United Kingdom. The most notable of these are 'Inequalities in Health: The Black Report' (Whitehead, 1999) and the 'Independent Inquiry into Inequalities in Health' (Acheson, 1998). Both reports conclude that while there have been improvements in the overall level of health, there are discrepancies between the health of people

in higher and lower socio-economic groups, with lower socio-economic groups experiencing higher mortality and morbidity for most disease. Research in many countries has shown that social class is an accurate predictor of mortality and there is growing evidence that social habits are related to health and morbidity patterns. According to Graham and Reeder (1979), 'Social class or socio-economic status can be related to all illness and health in general'. Social class not only points to a different life span but also a difference in the experience of illness throughout life. Power (1994) in his review of health and social inequalities in Europe stated that 'it is almost universally the case that people in lower social classes have more morbidity and disability and have shorter lives'. Zollner (2002) found in his review that this gap between social classes has persisted and appears to be widening. Several theories have been put forward to explain these inequalities in health including: The Artefact Theory; The Natural and Social Selection Theory; Materialistic / Structuralistic Explanations; Cultural / Behavioural Explanations (Power, 1994; Sim and Mackie, 2006; Smith et al., 1990; Whitehead, 1999). The causes of inequalities in health are complex and varied but inter-related. No theory explains all the findings or is universally accepted, but each theory can be used to explain some aspects of the findings. Black tended to favour the materialistic / structuralistic explanation of the inequalities in health and concluded that health inequalities involve access to and use of health services, social policy issues and general features of class, material inequalities and deprivation (Whitehead, 1999).

2.4.8 People with Disabilities and Material Deprivation

Gannon and Nolan (2006; 2005) found in their research, based on data collected in the Living in Ireland Survey (Whelan et al., 2003) and the Quarterly National Household Survey (Central Statistics Office, 2002), that about 38 percent of adults reporting a longstanding or chronic illness or disability are found to be at risk of poverty, more than twice the rate for other adults. Statistical analysis of the relationship between chronic illness or disability and poverty, controlling for other characteristics, suggests that the predicted risk of poverty is between 11 and 22 percentage points higher where the individual has a severely hampering disability and between 5 and 12 percentage points higher where he or she is hampered to some extent. Furthermore, their study identifies particular disadvantages for people with disabilities in relation to educational status, earnings and social

participation. Morgan and co-workers (2000) found in their study on health care provision for people with a learning disability a strong correlation between material deprivation and prevalence of leaning disability measured with the Townsend Index of social deprivation. This correlation may be explained by a concentration of social care homes within less affluent areas. However, this relationship is also apparent (although weaker) in younger age groups where patients will be resident within the family home. This may indicate the presence of aetiogical factors associated with social deprivation. Caring for a patient with learning disability may involve financial hardships and consequent social drift. Emerson and colleagues (2009) found in their longitudinal study of a nationally representative sample of 4-5 year old Australian children the association amongst intellectual disability, borderline intellectual functioning and exposure to social disadvantage well established. When they compared the study population to typically developing children, study group children identified at age 4-5 years as having intellectual disability or borderline intellectual functioning were significantly more likely to be exposed to socio-economic disadvantage when they grew older. These children account for disproportionate proportion of young Australian children exposed to socio-economic disadvantage (e.g. 33% of all children exposed to repeated income poverty, 38% of all children living in repeatedly workless households; 29% of all children exposed to repeated material hardship).

2.4.9 Dental Health and Material Deprivation

As with general health, inequalities exist in dental health. Socially disadvantaged groups, such as low-income, racial and ethic minorities and people with disabilities, suffer most from oral diseases. There are a number of reasons for this including socio-economic factors, lack of transport, disability or illness, which may limit access to services, lack of financial resources, lack of awareness of dental health and access to healthcare services. The link between dental health and social class was comprehensively reviewed by Locker (2000) and was found to be well established, but, as with general health, the explanation for this is still not clear. The oral health research literature shows evidence of social factors impacting on oral disease and illness (Nuttall, 2003). For Ireland, the dental health impact of social classes has been documented in the survey 'Oral health of Irish adults' (O'Mullane and Whelton, 1992). The purpose of the study was to establish the state of dental health of the adult population and to compare the results with

similar previous studies. A national representative sample of adults was chosen. In all, data from a total of 1,927 adults were included in the study. On completing the questionnaire, subjects were classified according to social class using the social scales (Table 2.1) outlined in the document prepared by 'The Working Party for the Development of an Irish Social Class Scale' (O'Hare et al., 1981).

Table 2.1: Classification According To Census Based Irish Social Class Scale (O'Hare et al., 1981)

Categories	Description
Social Class 1	Higher professional and higher managerial; proprietors and farmers owning 200 or more acres
Social Class 2	Lower professional and lower managerial; proprietors and farmers owning 100 - 199 acres
Social Class 3	Other non-manual and farmers owning 50 – 99 acres
Social Class 4	Skilled manual and farmers owning 30 – 49 acres
Social Class 5	Semi-skilled manual and farmers owning less than 30 acres
Social Class 6	Unskilled manual
Social Class 7	Unknown

Due to the low numbers examined in social class 7 (where the subjects' occupation and therefore social class was unknown), this category had been excluded from the analyses. The mean number of natural teeth present was highest in Social Class 1 compared with other social groups (Table 2.2). This trend is especially noticeable in the older age groups. For example, in those aged 65 years and older, the mean number of natural teeth present is 12.6 in Social Class 1 compared with a mean of 3.1 in Social Class 6 (unskilled manual).

Table 2.2: Mean Number Of Natural Teeth By Social Class Using The Classification Adopted By The CSO In The 1981 Census (Galvin et al., 1992)

Age	Social Class					
	1	2	3	4	5	6
16 - 24	27.4	27.1	27.5	27.4	26.9	26.5
25 - 34	27.0	26.2	25.4	24.6	25.1	21.3
35 - 44	24.0	22.3	20.9	19.5	18.7	20.6
45 - 54	19.4	15.7	14.3	14.6	9.9	12.2
55 - 64	16.0	10.3	10.3	7.1	5.9	5.7
65 +	12.6	9.3	9.1	6.3	5.3	3.1

For children, the impact of social class on dental health status has also been documented through several epidemiological studies, especially with respect to dental caries. The disadvantaged social groups have a higher proportion of teeth with unmet need for treatment and numbers of teeth missing due to caries compared with the advantaged groups. The survey 'Children's Dental Health in Ireland 1984' (O'Mullane et al., 1986) is the only national survey that documented the impact of deprivation level on the dental health status of children by the use of

a social class index. Using the father's occupation as the indicator of social class, it was found that children of fathers in social class AB (professional, managerial) had a lower mean DMFT than classes DE (unskilled, unemployed) (Table 2.3). This gradient is particularly evident in the case of 15-year-olds; the mean DMFT for class AB was 4.5 compared with 5.6 for classes DE. Children of farmers (F) had the highest mean DMFT in 15-year-olds.

Table 2.3: Children's Dental Health In Ireland 1984: Social Class And Mean DMFT (O'Mullane et al., 1986)

Social Class	8-year-olds (n = 1,046)		15-year-olds (n =1 ,105)	
	%	DMFT	%	DMFT
AB	8	0.7	13	4.5
C_1	18	1.0	22	5.0
C_2	27	0.9	21	4.9
DE	28	0.9	17	5.6
F	19	0.9	27	5.9

Social class can also be used as a predictor of the frequency of visits to the dentist. The survey 'Children's Dental Health in Ireland 1984' (O'Mullane et al., 1986) documented that 44 percent of 15-year-old subjects in social class AB visited six times in the previous three years the dentist compared with 24 percent in social class DE. The percentage of the latter group who had no visit in the last three years or who did not know was 35 percent whilst only 12 percent in class AB fell into this category (Table 2.4).

Table 2.4: Children's Dental Health In Ireland 1984: Relationship Between Social Class And Length Of Time Since Last Visit To The Dentist (%) (O'Mullane et al., 1986)

Social Class	8-year-olds			15-year-olds			
	<1 year	≥1 year	Total	<1 year	≥1 year	Primary School	Total
AB	71	29	100	75	13	12	100
C_1	74	26	100	62	15	23	100
C_2	61	39	100	54	18	28	100
DE	52	48	100	52	16	32	100
F	63	37	100	47	19	34	100

2.4.10 Other Methods to Stratify Social Groups: Medical Card Status

Ownership of a medical card is commonly used as a surrogate for disadvantage in the Republic of Ireland. Medical card status is essentially designed to meet the needs of people who are unable, without undue financial hardship, to arrange general practitioner medical and surgical services plus dental, optometry and aural services for themselves and their dependants. All adults and their dependants who are ordinarily residents in Ireland can apply for a medical card – but with specific exceptions, people have to pass a means test. The income guidelines vary according to age and whether the person lives alone, with spouse / partner, or with

family. The HSE has a number of standardised procedures for applying the guidelines. There is no legally fixed definition of undue hardship. For example, Medical Cards are usually granted to children in foster care or recipients of disability allowance. The income guidelines for Medical Card eligibility are revised annually in line with changes in the Consumer Price Index. A medical card is usually issued for a year, after which it is reviewed. At the end of December 2009 this group constituted approximately 33 percent of the population (Health Service Executive, 2010). People on the following allowances are regarded as eligible for the medical card without further means testing:

- Old Age Non–Contributory Pension;
- Deserted Wife's Allowance;
- Infectious Diseases (Maintenance) Allowance;
- Disability Allowance;
- One-Parent Family Payment;
- Widow's / Widower's (Non–Contributory) Pension;
- Orphans (Non –Contributory) Pension;
- Blind Person's Pension;
- Supplementary Welfare Allowance.

People aged 16 – 25 who are financially dependent on their parents are entitled to a medical card in their own right if their parents are medical card holders. Those who are financially independent of their parents i.e. working or receiving a social welfare payment in their own right will have their income assessed on the same income criteria as other applicants. Between July 2001 and until January 2009 everyone aged over 70 years was eligible for a medical card regardless of their income. About 1,276,178 persons or 30.10 percent of the population were eligible to hold a medical card in January 2009 (Table 2.5) (HSE, Primary Care Reimbursement Service, 2009).

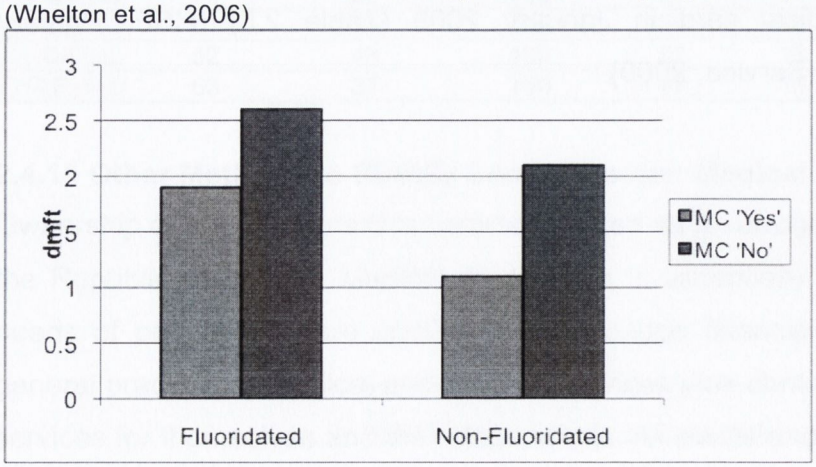
Table 2.5: Number Of Eligible Persons For A Medical Card As At 31.12.2007 (HSE, Primary Care Reimbursement Service, 2009)

HSE region	Eligible persons to hold a medical card
Eastern Areas	373,007
Midland	78,955
Mid-Western	116,265
North Eastern	112,213
North Western	105,465
South Eastern	154,617
Southern	190,759
Western	144,897
National	1,276,178

2.4.11 Dental Health Status in Relation to Medical Card Status

Social class has repeatedly emerged as a major factor to explain the variation in prevalence and severity of dental caries and periodontal disease (Addy et al., 1990). In adults, frequency of tooth brushing increases as socio-economic status improves (Morris et al., 2001; Sheiham, 1970). Similarly, children from higher social classes are more likely to brush their teeth regularly than children from lower social classes (Beal and Dickson, 1974; Macgregor and Balding, 1987). The Oral Health Services Research Centre (University College Cork) conducted on behalf of the Department of Health and Children a survey of the dental health of children in the Republic of Ireland and Northern Ireland in 2002 (Whelton et al., 2006). The survey documented that in the Eastern Region as a whole and in each of the three area health boards, dental caries levels were higher in children whose parents were medical holders when compared with children whose parents were non-medical card holders Figure 2.3).

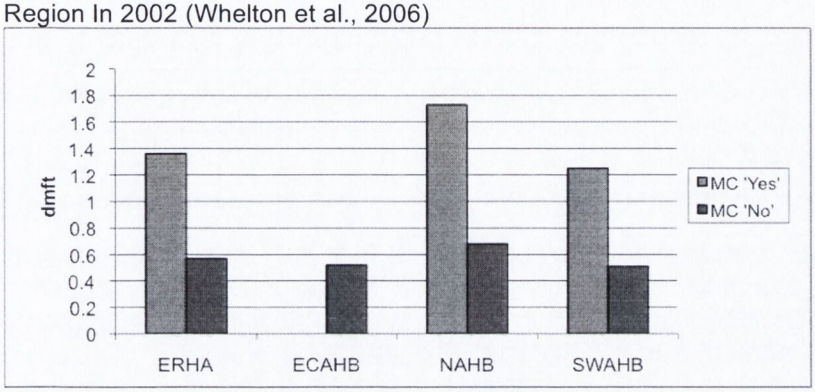
Figure 2.3: Mean dmft In 5 Year-Olds By Medical Card (MC) Status ('No', 'Yes') In Ireland In 2002 (Whelton et al., 2006)



This difference is particularly striking amongst 5-year-olds in the Dublin area where the level of dental caries in primary teeth of children whose parents possess

a medical card is more then twice as high as the level found amongst children whose parents did not possess a medical card (Figure 2.4). ERHA, ECAHB, NAHB, and SWAHB are abbreviations for the four administrative areas in Dublin at the time of data collection.

Figure 2.4: Mean dmft In 5 Year-Olds By Medical Card (MC) Status ('No', 'Yes') In The Eastern Region In 2002 (Whelton et al., 2006)



2.5 Health and Oral Health Promotion

2.5.1 The Concept of Health Promotion

The World Health Organization's 2005 'Bangkok Charter for Health Promotion in a Globalized World' (World Health Organization, 2005) has defined health promotion as 'the process of enabling people to increase control over their health and its determinants, and thereby improve their health'. The Bangkok Charter complements and builds upon the values, principles and action strategies of health promotion established by the Ottawa Charter for Health Promotion (World Health Organization, 1986). Health promotion addresses non-medical factors influencing health, ranging from the modifiable behavioural factors including smoking, alcohol consumption, diet, nutrition and exercise through to the broader structural determinants such as poverty, unemployment, housing, education, living and working conditions. Because health promotion addresses far broader determinants of health than just medical or clinical factors it influences primarily through the social settings where people live their lives, in homes, schools, workplaces and communities. As health promotion moves beyond a disease prevention focus towards a more comprehensive holistic approach it is complementary to, but significantly different from, that undertaken by public health medicine. However, health promotion has often been reduced to health education focused on changing behavioural risk factors (Bunton and Macdonald, 2002). Many of the key principles of health promotion including community participation, partnership, equity and social inclusion have been adopted in national policy documents including Building

Healthier Hearts (Department of Health and Children, 1999), the National Anti-Poverty Strategy (Department of the Taoiseach, 1997), Sustaining Progress (Department of the Taoiseach, 2003), Quality and Fairness: A Health System For you (Department of Health and Children, 2001), Oral Health & Disability: The Way Forward (National Disability Authority, 2005) and Promoting Oral Health in Ireland (Dental Health Foundation, 2008). Health promotion has the capacity not only to improve health but also to contribute to the reduction of other problems such as social inequities. There is an increasing evidence base demonstrating the feasibility of implementing effective health promotion programmes leading to long-term positive health and social gain (Englert et al., 2007; Mozaffarian et al., 2009; Wendel-Vos et al., 2009).

2.5.2 Health Education

Health education is not only concerned with the communication of information, but also with fostering the motivation, skills and confidence necessary to take action to improve health. Health education includes the communication of information concerning the underlying social, economic and environmental conditions impacting on health. It also includes individual risk factors and risk behaviours and use of the health system. The following two definitions are useful in developing a common understanding of health education: 'Health education is any planned activity which promotes health or illness related learning; that is, some relatively permanent change in an individual's competence or disposition' (Tones, 1990) 'Health education is not about behaviour change, and it is not about overt political action to affect the determinants of health. Rather, health education is about enabling - supporting people to set their own health agendas, agendas they can implement in ways decided by themselves collectively or as individuals' (French, 1990). The terms health education and health promotion are often used interchangeably. They are often seen as similar concepts and people are sometimes unsure of the factors that distinguish then from one another. While there is a close relationship between the two concepts, health promotion is a broader concept and an umbrella term, which includes health education as one component in its broader remit. The overall aimed outcomes of an effective health education programme are that the target population know and accept themselves for what they are, have increased self-esteem and make responsible decisions about their health behaviour. They can communicate with others, negotiate healthy

relationships, are able to differentiate high and low risk behaviours, protect themselves and others and know how to gain access to and use health care information and services. There is a range of different approaches to health education. Each of these has their own strengths and challenges and should be selected based on their appropriateness of the target group to which health education is being delivered. The National Youth Health Programme (2006) provided an overview on the most common approaches to health education (Table 2.6).

Table 2.6: Approaches To Provide Health Education (National Youth Health Programme, 2006)

Health Education Approaches	Characteristics of the approach
Information-Only Approach	Information provided: • verbally • through leaflets/posters etc. • via radio/TV • via telephone help-lines • through reports to policy makers • through reports to employers/communities to share information
Life Skills Approach	-Focuses on enhancing self-esteem and self-efficacy -Aims at shaping values, attitudes and developing personal skills -Uses methods which are learner-centred, age and culturally appropriate, gender sensitive, interactive and participatory
Comprehensive Health Education Approach	-Looks at health from a holistic perspective & emphases the different aspects & dimensions of health -Looks at a variety of issues and determinants their impact on health
Peer Education Approach	-Focuses on the peer educators modelling appropriate behaviours & teaching social skills, rather than just producing factual information -Assumes that peers are more likely to have the kind of credibility with other peers that may be quite difficult for a professional worker to acquire
Harm Reduction Approach	-Aims to reduce harm from risky health behaviours through the provision of accurate information about health and risk-taking behaviour -Promotes the development of healthier choices
Agenda Setting	-Involves consciousness raising with public and legislative/policy makers about a health issue prior to introducing some policy or legislative change

2.5.3 Oral Health Promotion

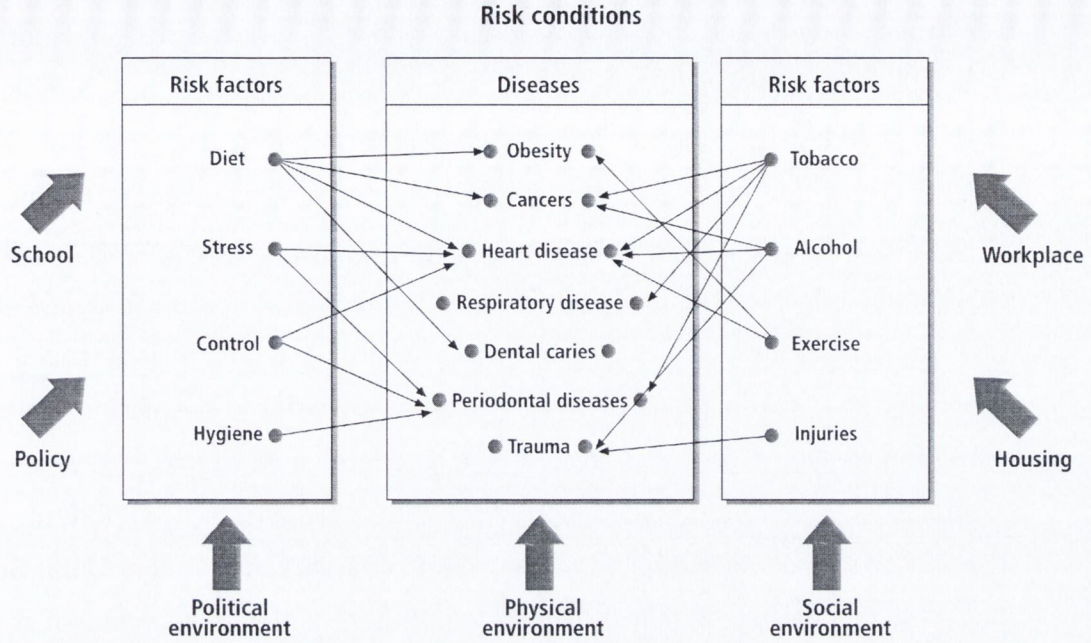
The traditional concept of dentistry to focus on the eradication of disease from the mouth and to view the mouth separately from the rest of the body has been gradually replaced by a contemporary definition of health and well-being because oral health affects general health and may cause considerable pain and suffering and may subsequently change what people eat, affect their speech and their quality of life. In addition, the absence of oral health and well-being may have an effect on other chronic diseases (Petersen, 2003). Consequently, oral health needs to be incorporated into general health promotion to be effective. Failure to

tackle social and material determinants result in parts of the population suffering from poor oral health and reduced quality of life.

Oral health affects people physically and psychologically and influences how they enjoy life, look, speak, chew, taste food and socialise (Locker, 1997). Severe dental caries may substantially reduce children's quality of life: they experience pain or discomfort, acute and chronic infections, and eating and sleep disruption as well as higher risk of hospitalization, high treatment costs and loss of school days with the consequently diminished ability to learn. Children of three years of age with 'nursing bottle' caries weighed about 1 kg less than control children (Ace et al., 1992), because toothache and infection alter eating and sleeping habits, dietary intake and metabolic processes.

Contemporary concepts of health suggest that oral health should be defined in general physical, psychological and social well-being terms in relation to oral status. Cohen and Jago (1976) consider the greatest contribution of dentistry is to improve quality of life. Disruptions in physical, psychological and social functioning are therefore important in assessing oral health. Traditional measures use mainly clinical indices, though there are supplement measures of oral health-related quality of life available in order widen the assessment of the patients need (Sheiham and Tsakos, 2005). Because oral and other chronic diseases have determinants in common, more emphasis should be on the common risk factor approach (Sheiham, 2005). The key concept underlying future oral health strategies is integration with this approach, a major benefit being the focus on improving health conditions in general for the whole population and for groups at high risk, thereby reducing social inequities. By integrating oral health into strategies for promoting general health and by assessing oral needs in socio-dental ways, health planners can greatly enhance both general and oral health (Figure 2.5).

Figure 2.5: Common Risk Approach (Modified from Sheiham and Watts, 2000)



2.5.5 Oral Health Education

Oral Health education is a prerequisite for healthy choices and behaviour, and for enabling self-care (Freeman et al., 1993). Oral health care services have traditionally targeted children and adolescents for oral health education and delivered oral health education to individuals and groups in settings such as dental practice, schools workplace or day-care and residential settings. Furthermore, the population as a whole can also be targeted by using mass media campaigns (Kay and Locker, 1996). Kay and Locker reviewed in 1996 the effectiveness of oral health education. The results of this review suggest that individual's level of knowledge can relatively easily be improved by oral health education, but no clear evidence on the impact on behaviour i.e. behaviour change was found. Furthermore, Croucher (1993) demonstrated that knowledge alone does not bring about sustained behavioral change.

The main focus of the dental services is often on the content in the oral health messages, and evidence-based, correct information is undoubtedly important (Levine and Stillman-Lowe, 2004). However, these efforts will not achieve their purpose if they fail to reach their target audience. Effective oral health education needs to address more than a person's level of knowledge. For that reason, oral health education needs to aim to communicate knowledge and subsequently to influence a person's life-style as well. The traditional perspective of knowledge is that it is measurable with a characteristic of quantitative growth. However,

knowledge can also be described as an internalised process, which influences an individuals' view of and the way of dealing with reality (Lave, 1999). Hedman and co-workers (2009) found Söderberg's concept of 'education' as a combination of factual knowledge and emotional or social aspects as most useful. Following this concept, 'Information' as such can be considered as one-way communication without any consideration of the patients' emotional and social needs. However, the process of learning is dynamic and is based on the individual's previous knowledge and experiences. Furthermore, learning is actually a social activity, something that takes place between people while they interaction, rather than something that is constructed solely in the individual mind (Lave, 1999).

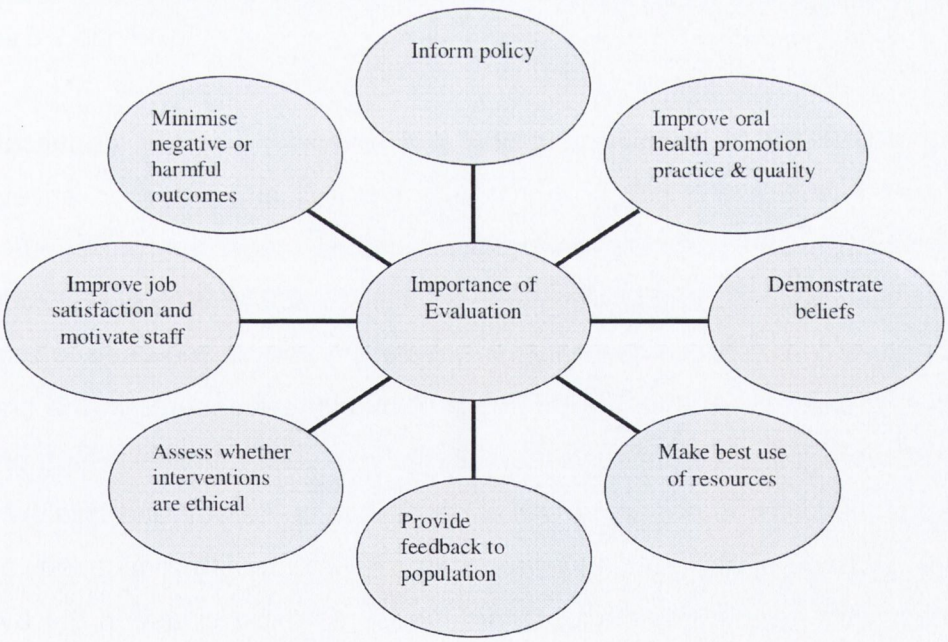
In health education, the perceptions of the individual are important, both in planning and evaluating applied measures (Coleman and Hendry, 1999; Springett, 2001). Syrjala and co-workers (2001) emphasized the importance of a patient-centred oral health education. This is particularly significant for young people, as their perceptions of health and health risks can differ from those of adults (Coleman and Hendry, 1999; Östberg et al., 2002). Adolescence is a period of life when many behaviours and attitudes are established. For that reason, health-care messages have to be adapted to the developmental stages of the individual (Honkala, 1993; Petersen, 1995). In order to steer oral health education in a patient-centred direction, it is important to appreciate the perception of dental self-efficacy. People perform activities they find they can manage but avoid those they believe they are unable to cope with (Bandura, 1981). For that reason, adequate incentives and appropriate skills must be in place for an activity to be performed (Bandura, 1981). The formation of perceived self-efficacy is a life-long process and self-efficacy is reappraised in various situations in life (Bandura, 1981). Ostberg and co-workers (2005) found in their qualitative study on the perception of oral health education that the credibility of the people delivering the health messages is essential, as is their ability to create confidence during the encounter in the dental setting. When oral health education is perceived to be credible, it generates confidence. In addition, when confidence is perceived, the oral health messages will be credible. Thus, oral health education requires evidence-based, correct information but is only likely to be successful when credibility and confidence are perceived.

2.5.6 Evaluation of Oral Health Education Programmes

The development and implementation of evidence-based practice is important for any interventions in health care. Oral health care has been developed from a bio-medical research paradigm. Clinical research has therefore been based on experimental methodology and quantitative sciences. Clinical interventions have been effectually evaluated by the use of randomised control trial. However, other approaches and methods are required in evaluating oral health education programmes (WHO European Working Group on Health Promotion Evaluation, 1998). Evaluation of oral health education is important for a variety of reasons including (Figure 2.6):

- as a means of developing effective interventions;
- to share and disseminate examples of good practice;
- to make best use of limited resources;
- to provide feedback to staff and participants;
- to inform policy development and implementation.

Figure 2.6: Importance Of Evaluation Of Oral Health Education Programmes (Watt et al., 2004)



Although widely recognised as being important, evaluation of interventions is often a neglected area of practice. There are many reasons for the lack of progress with evaluation, including inadequate provision of resources, time and support for the evaluation process, and a lack of appropriate evaluation frameworks. As a result, the quality of evaluation had been reported as poor (Brown, 1994; Kay and Locker, 1998; Sprod et al., 1996).

The strengths and weaknesses of different evaluation methods need to be considered (Puska, 2000). Both quantitative and qualitative approaches have an important role to play in the evaluation of community oral health programmes (Petersen, 1989). The choice of methods depends on the nature of the intervention, the purpose of the evaluation and the resources available. A comprehensive evaluation of any community based intervention requires both process and outcome data. One of the criticisms emerging from reviews of the oral health prevention literature was the inappropriate nature and poor quality of outcome measures used (Sprod et al., 1996). Process evaluation seeks data on how the intervention was implemented and may uncover information on unexpected results. This type of information is valuable as feedback in reviewing the development and delivery of the intervention. Outcome measures may be useful indicators assessing the effects of the intervention (Nutbeam, 1998). However, high-quality evaluation requires both time and expertise, and therefore resources. The WHO recommends that at least 10 percent of resources of a health promotion programmes should be allocated to the evaluation of interventions (WHO European Working Group on Health Promotion Evaluation, 1998).

Watt and co-workers (2006) undertook extensive work on the identification and quality assessment of available outcome measures and prepared an evaluation toolkit, which aims to provide appropriate outcome measures for various aspects of oral health education and promotion (Watt et al., 2004). Watt et al. (2006) found in their study that a set of quality criteria were developed and used to assess the identified measures. A significant number of outcome measures in the oral health literature were identified although their quality was very variable. A high proportion of the identified measures were classified as health literacy and healthy lifestyle outcomes, appropriate for the evaluation of oral health education activities. However, very few high-quality outcome measures exist for use in the evaluation of oral health policy and environmental interventions. Watt et al., (2006) concluded that with the change in emphasis from oral health education towards a broader health promotion approach being now widely advocated (World Health Organization, 2003), further research to develop outcome measures for use in the evaluation of oral health policy and environmental action, particularly with a focus on tackling inequalities.

2.5.7 Oral Health Education Programmes in the Republic of Ireland

Health education is a cornerstone within health promotion (Ewles and Simnett, 2003; Laverack, 2004). In order to insure effective oral health education as part of a health promotion plan all HSE dental services established at primary care level dedicated oral health promotion teams. These oral health promotion teams systematically target primary schools in their local care area and provide them with oral health education based on one of following programmes:

Mighty Mouth Schools Programme (5-6 year olds)

The Mighty Mouth Schools Programme was developed by the Dental Health Foundation in collaboration with former local health boards, which is today the HSE, oral and general health promotion teams in the eastern region of Ireland and in partnership with teachers, parents and children. The programme was developed as an evidence-based oral health education/promotion tool for the overall delivery of dental care services for young children. The aim of this programme was to focus attention on the importance of oral health for children who are at greatest risk of developing dental disease. The programme focused on the value of good dental care as part of children's overall health and well-being. The programme in particular emphasised the essential role of tooth-friendly foods and drinks, and of supervised regular effective tooth brushing with fluoride toothpaste. It also includes information and advice on dental services for children. The programme used an educational settings-based approach and was developed based on the needs identified by parents and teachers concerned with children's oral health. Furthermore, it is also consistent with the Social Personal Health Education curriculum for primary schools in Ireland.

Winning Smiles (7-8 year olds)

Winning Smiles is a school-based oral health promotion programme, which was developed, based on an oral hygiene intervention programme developed by the former local health board, which is today the HSE, and the Dental Health Foundation in North-Dublin in the 1990's. The revised programme incorporated the new research findings (i.e. provision of free fluoride toothpaste and brushes) in order to reduce childhood health disparities and promote oral health as well as psychological health and social well-being. Winning Smiles, was subsequently introduced and evaluated in schools randomly chosen from those located in areas of high social deprivation and disadvantage in Dublin and Belfast. Children in their

fourth year of primary education (7 to 8-year-olds) were target to participate. Winning Smiles aimed to encourage fluoride toothpaste use, to improve child oral health-related quality of life and self-esteem, and finally to increase oral health-related knowledge and attitudes, as well as assessing changes in reported oral health behaviours.

Cool Water – Cool Smiles (secondary school children)

The Cool Water – Cool Smiles project was developed by the dental service and the health promotion service of the former local health board in the North-West of Ireland, which is today the HSE, and funded by the Dental Health Foundation. The project targeted first year students in secondary schools. The aim of the project was to reduce the consumption of soft drinks during school day by the provision of healthier alternatives (in particular the use of drinking water), raising awareness of damage caused by frequent consumption of soft drinks and positive peer influence in order to keep using those healthier alternatives.

The Magic Tooth (blind children)

The Magic Tooth is children's storybook in Braille, large print and in Irish. The book, telling the story of a young girl who loses her first tooth and visits Fairy Land with her tooth fairy, was produced in 2001 by The National Council for the Blind of Ireland the Dental Health Foundation and Gael Linn and distributed and used nationwide by the HSE dental service and the health promotion service.

Healthy Teeth for Life – A Guide to your Childs Dental Health (parents)

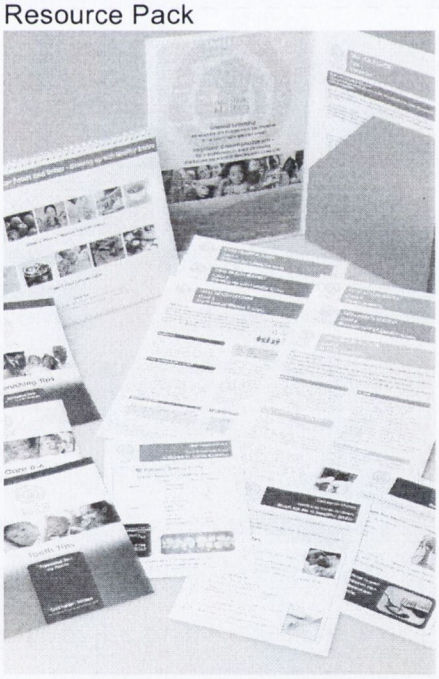
Healthy Teeth for Life is a booklet for parents which gives comprehensive factual information on all aspects of children's teeth. The booklet was produced in 2005 by the Dental Health Foundation and has been distributed and used nationwide by the HSE dental service and the health promotion service.

2.5.8 Pilot Project to Provide Early Oral Health Promotion for Pre-school Children with Disabilities in the HSE North-East

In 2000 / 2001 a group of oral health care professionals in the HSE North-East realised that there was a lack of a dedicated, targeted dental services for pre-school children with disabilities. Up until that point in time, children with disabilities aged 0 – 6 years, only came to the attention of HSE dental service largely when they attended as emergencies, i.e. were in pain, and usually requiring general

anaesthesia for extraction of affected primary teeth, as there was, and still is, no dedicated publicly funded primary dental service for any pre-school child available in Ireland. In order to address these concerns for pre-school children with disabilities, a multidisciplinary steering group consisting of representatives of HSE dental services, disability services, health promotion, nutritionists / dieticians and the Dental Health Foundation was formed. This steering group's overall aim was to develop a comprehensive, integrated, holistic approach to oral health care for pre-school children with disabilities in the HSE North-East. The vision of the project was that an early intervention, preventive approach would help focus both professionals and parents on the need to provide oral health, and reduce dental treatment. The Irish Dental Health Foundation funded the production of an Oral Health Promotion Resource Pack for use by all health professionals working with children with disabilities (Figure 2.6).

Figure 2.7: Content Of The HSE North-East Oral Health Promotion Resource Pack



This resource pack was to be used as a reference for any primary care personnel working with young children with disabilities and who were asked about oral health. The final prevention programme was build on two pillars: firstly, when a young child was diagnosed as having special care needs in the HSE North-East, he or she was to be referred to the HSE dental service for a clinical oral assessment and an individual, needs based prevention plan would be developed for the child. Secondly, the oral health promotion teams in the HSE North-East offered one-to-one sessions with parents / caregivers in order to personally deliver key oral health messages and provide a supportive dental environment.

2.6 Dental Health of Young Children in Ireland

There are several epidemiological studies available, which seek to report on the dental health of school children in the Republic of Ireland. However, the youngest age group examined in any of the surveys are 5-year-old children. There are

currently no national epidemiological data available on the dental health of children younger than 5-years of age.

MRC Pre-fluoridation Study, 1961-63

In 1961, prior to the introduction of water fluoridation a survey of dental decay in a representative sample of pupils attending full-time day schools had to be undertaken. The dental decay survey was undertaken by the Medical Research Council (Minister for Health 1965) at the request of the Minister for Health. A team of public health dentists with their recording assistants carried out the survey examinations. The survey began in May 1961 and ended in December 1963, when the entire state had been covered. In all over 96,000 children were examined. The methods and criteria for this survey was a duplication of those used in the 1952 survey. The survey disclosed high levels of decay in all areas. The average number of decayed missing and filled teeth (dmft) per child aged 5 years was 5.6. The percentage of 5-year-olds found to be caries free was approximately 15 percent (Minister for Health 1965).

Children's Dental Health in Ireland, 1984 (O'Mullane et al., 1986)

In 1984 the Minister for Health commissioned a national survey of children's dental health, the main aim of which was to measure the effectiveness of water fluoridation in the prevention of dental decay (O'Mullane et al., 1986; O'Mullane et al., 1988). This national survey was conducted on behalf of the Minister for Health by the University College Cork in 1984 (O'Mullane et al., 1986). Children in infant (5-year-olds), second (8-year-olds) and sixth (12-year-olds) standard in primary schools and in Intermediate Certificate Standard (15-year-olds) in second level schools were examined. 142 primary schools and 102 secondary schools were included in the sample. In all, 9,473 children were examined. The survey reported data on dental caries (dmft / DMFT), periodontal disease (CPITN), enamel opacities / fluorosis (DDE-Index, Dean's-Index), trauma of anterior teeth and dentofacial anomalies (Treatment Priority Index). Dental caries was recorded for each surface. The diagnostic criteria for caries were based on those used in the International Collaborative Study (World Health Organization, 1985) and the pre-fluoridation baseline study (Minister for Health 1965). The need for treatment of periodontal disease was assessed in 12- and 15-year-olds using the procedures and criteria of the Community Periodontal Index of Treatment Needs (CPITN)

(Ainamo et al., 1982). The presence of enamel opacities including fluorosis in permanent teeth was assessed in 8-, 12- and 15-year-olds using the Development Defects of Enamel (DDE) Index (Fédération Dentaire International, 1982) and Deans Index (Dean, 1934). The criteria to assess 8-, 12- and 15-year-olds for trauma of permanent incisors were based on those used in the survey of Cork city school children (O'Mullane, 1972). Antero-posterior molar relationship, posterior crossbite, posterior openbite, midline deviation, overjet, open-bite, crowding, spacing and diastema were assessed in 12- and 15-year-olds using criteria similar to those recommended by WHO for use in the International Collaborative Study (World Health Organization, 1985). This survey showed that there had been a major decline in the prevalence of caries in children in Ireland when compared to a pre-fluoridation survey conducted in 1961-63 (Minister for Health, 1965). The overall (i.e. nationwide) dmft in 5-year-olds who had resided all their lives in a fluoridated community was 1.8 and their peers in non-fluoridated communities experienced a dmft level of 3.0. The decline of dental caries was greatest in children who had been lifetime residents of communities with fluoridated water. The percentage of 5-year-olds found to be caries free was also highest in this group of children (approximately 52%) compared to residents of non-fluoridated communities with caries free levels of 38 percent. This survey also recorded information about the relationship between sociological variables (Medical Card status) and dental caries levels.

Children's Dental Health in the Western Health Board Region, 1991-1992 (Western Health Board, 1994)

In 1991-92 the Dental Department of the former Western Health Board, in collaboration with the Oral Health Services Research Centre of the University College Cork, conducted a survey (Western Health Board, 1994) to report on children's dental health, using criteria very similar to those of in the 1984 survey (O'Mullane et al., 1986). A total of 628 junior infant children were examined in Community Care Areas of Galway, Mayo and Roscommon. The survey reported in 5-year-olds an overall mean dmft of 1.7 and a mean dmft for fully-fluoridated versus non-fluoridated areas of 1.0 versus 2.1, respectively. The percentage of 5-year-olds found to be caries free was 68.1 percent in the fully-fluoridated group of children compared to residents of non-fluoridated communities where 38 percent were caries free.

Children's Dental Health in the Eastern Health Board Region, 1993 (Eastern Health Board, 1994)

In 1993 the Dental Department of the former Eastern Health Board conducted, in collaboration with the Oral Health Services Research Centre of the University College Cork, a survey (Eastern Health Board, 1994) to report on children's dental health using criteria very similar to those of in the 1984 survey (O'Mullane et al., 1986). A total of 2352 junior infant children were examined in the Eastern Health Board region, approximately 1711 children in Dublin city and 629 children in the Dublin county areas. The 1993 survey showed a decline in the prevalence of dental caries by 46 percent (mean dmft 0.7 from 1.2 in 1984) for the 5-year-olds in Dublin city and a dmft score of 1.7 in the Dublin county areas. The percentage of 5-year-olds found to be caries free was 74.0 percent in Dublin City and 52.0 percent in the Dublin county areas.

Oral Health of Children and Adolescents 1995 (Southern Health Board, 1995)

In 1995 the Dental Department of the former Southern Health Board conducted in collaboration with the Oral Health Services Research Centre of the University College Cork survey (Southern Health Board, 1995) to report on children's dental health using criteria very similar to those of in the 1984 survey (O'Mullane et al., 1986). A total of 1070 junior infant children were examined. The survey reported in 5-year-olds a mean dmft for full-fluoridated versus non-fluoridated areas of 1.1 versus 2.3 respectively.

Oral Health of Children and Adolescents 1995 (North-Eastern Health Board, 1995)

In 1995 the Dental Department of the former North-Eastern Health Board conducted in collaboration with the Oral Health Services Research Centre of the University College Cork survey (North-Eastern Health Board, 1995) to report on children's dental health using criteria very similar to those of in the 1984 survey (O'Mullane et al., 1986). A total of 583 junior infant children were examined in the Community Care Areas of Cavan/Monaghan, Louth and Meath. The 1995 survey showed a dental caries prevalence of 1.2 for the 5-year-olds residing in full-fluoridated areas and a dental caries prevalence of 1.8 in non-fluoridated areas.

Survey of Oral Health of Children and Adolescents 1997 (Mid-Western Health Board, 1998)

In 1997 the Dental Department of the former Mid-Western Health Board conducted in collaboration with the Oral Health Services Research Centre of the University College Cork another survey (Mid-Western Health Board, 1998) to report on children's dental health using similar criteria to those in the 1984 survey (O'Mullane et al., 1986). A total of 596 junior infant children were examined in the Mid-Western Health Board region. The 1997 survey showed a dmft of 1.7 for the 5-year-olds who resided in water fluoridated area all their lives and a dmft of 2.9 for children who were not connected to the public water supply.

Oral Health of Children 1997 (Eastern Health Board, 1997)

In 1997 the Dental Department of the former Eastern Health Board conducted in collaboration with the Oral Health Services Research Centre of the University College Cork another survey (Eastern Health Board, 1997) to report on children's dental health using similar criteria to those in the 1984 survey (O'Mullane et al., 1986) and the 1993 survey (Eastern Health Board, 1994). A total of 645 junior infant children were examined in the Eastern Health Board region. The 1997 survey showed a dental caries prevalence of 1.0 for the 5-year-olds in the Dublin region. The percentage of 5-year-olds found to be caries free was 67.0 percent in Dublin region.

Survey of Oral Health of Children and Adolescents 1997/'98 (North-Western Health Board, 1998)

In 1997 the Dental Department of the former North-Western Health Board conducted in collaboration with the Oral Health Services Research Centre of the University College Cork, another survey (North-Western Health Board, 1998) to report on children's dental health using similar criteria to those in the 1984 survey (O'Mullane et al., 1986). A total of 702 junior infant children were examined in the North-Western Health Board region. The 1997/'98 survey showed a dmft of 1.1 for the 5-year-olds who had resided in water fluoridated area all their lives and a dmft of 1.8 for children whose households were not connected to the public water supply.

Oral Health of Children and Adolescents in the South Eastern Region 1998/'99 (Health Service Executive, South Eastern Area, 2005)

In 1998/99 the Dental Department of the former South-Eastern Health Board conducted, in collaboration with the Oral Health Services Research Centre of the University College Cork survey (Health Service Executive, South Eastern Area, 2005) to report on children's dental health using criteria very similar to those of in the 1984 survey (O'Mullane et al., 1986). A total of 758 junior infant children were examined in the Community Care Areas of Carlow, Kilkenny, South Tipperary, Waterford and Wexford. The 1998/99 survey showed a dental caries prevalence of 1.3 for the 5-year-olds residing in fully-fluoridated areas and a dental caries prevalence of 2.3 in non-fluoridated areas.

Children's Oral Health in Ireland, 2002 (Whelton et al., 2006)

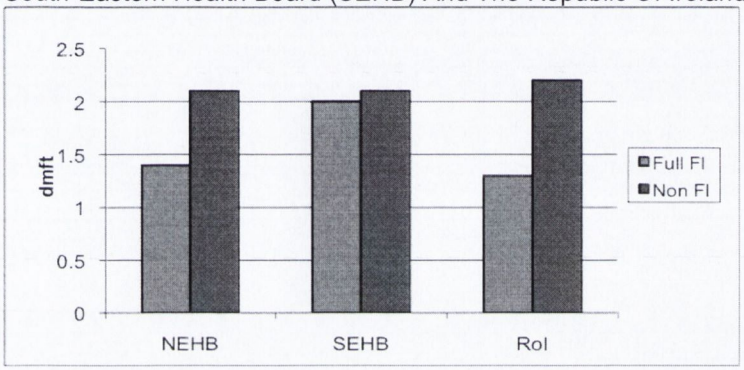
In 2002 the Minister for Health commissioned a North South study of the dental health of children and adolescents on the island of Ireland. The survey was conducted on behalf of the Minister for Health and Children by University College Cork in 2002 (Whelton et al., 2006). The groups chosen were 5-, 8-, 12- and 15-year-old children in the Republic of Ireland and in Northern Ireland. In all, 19,950 children and adolescents were examined, 17,838 in the Republic of Ireland and 2,112 in Northern Ireland. This survey provides the most current dental health data on these age groups. The report presented data on dental caries (dmft / DMFT), enamel opacities / fluorosis (DDE-Index, Dean's-Index) and trauma of anterior teeth. The 2002 survey showed an overall dmft of 1.3 in water-fluoridated areas and 2.2 in non-fluoridated areas for the 5-year olds in the Republic of Ireland. Table 2.7 demonstrates clearly that there has been a major decline (from a dmft level of 5.6 in 1963) in the prevalence of dental caries levels in 5-year-old children in the past 40 years.

Table 2.7: Trends In Mean dmft In 5-Year-Olds In The Republic Of Ireland 1984-2002

Survey		Children's Dental Health in Ireland	EHB Survey	SHB Survey	NEHB Survey	MWHB Survey	EHB Survey	NWHB Survey	SEHB Survey	Children's Oral Health in Ireland
Year		1984	1993	1995	1995	1997	1997	1997/98	1998/99	2002
Mean dmft	Water Fluoridation	1.8	0.9	1.1	1.2	1.7	1.0	1.1	1.3	1.3
	No Water Fluoridation	3.0	--	2.3	1.8	2.9	1.7	1.8	2.3	2.2

Table 2.8 illustrates the dmft scores in 5-year olds for the Republic of Ireland (RoI) and for the former North-Eastern Health Board, NEHB, (now part of the HSE Dublin – North-East administrative area) and for the former South-Eastern Health Board, SEHB, (now part of the HSE South administrative area) in 2002. The results show a regional variation in dental caries prevalence. Mean dmft levels among 5-year olds were 1.3 (RoI), 1.4 (NEHB) and 2.0 (SEHB) for children who consumed fluoridated water from birth and 2.2 (RoI), 2.1 (NEHB) and 2.1 (SEHB) in children who resided in non-fluoridated areas in 2002.

Figure 2.8: Mean dmft Among 5-Year-Old Children Residing In Areas With Water Fluoridation (Full FI) and Without Water Fluoridation (Non FI) In The Former North-Eastern Health Board (NEHB), South-Eastern Health Board (SEHB) And The Republic Of Ireland (RoI) (Whelton et al., 2006)



Fluoride has contributed to improvements in dental health in non-fluoridated as well as fully fluoridated areas. The use of fluoridated toothpaste is almost universal in 2002; over 95 percent of toothpaste sold in Ireland contains fluoride (Forum on Fluoridation, 2002; Whelton et al., 2006). These toothpastes were introduced to the market in the early 1970s. It has been argued that a reasonably valid control group to discuss the impact of water fluoridation in the decline of dental decay levels would be residents of Northern Ireland where the water supplies are not fluoridated and where, as in the Republic of Ireland, fluoride toothpastes were also introduced in the early 1970s (O'Mullane et al., 1988). Comparisons have been made between dental health levels in the Republic of Ireland and Northern Ireland, where less than 20,000 people drink fluoridated water. During 1963 a representative sample of school children in Belfast was examined for dental caries using criteria similar to those being used in the UK at the time (Sheane, 1963) and similar to those adopted in the pre-fluoridation baseline surveys in the Republic of Ireland in 1961-63. In 1983 the decennial survey of children's dental health in the United Kingdom conducted by Office of Population Censuses and Surveys (OPCS) included examinations of a representative sample of children in Northern

Ireland (Todd and Dodd, 1985). In 1990 the Oral Health Services Research Centre (University College Cork) directed a survey in Northern Ireland (Whelton et al., 1991) using the same examination criteria used in the 1984 National Survey of Children's Oral Health. The results of these surveys for 8-, 12- and 15-year-old children are presented in Table 2.8. In 1963 the mean DMFT was little higher in Northern Ireland (Belfast) than it was in the Republic of Ireland in 1961-63, the figures for 8-year-old children, for example, being 2.0 as against 1.7. Even allowing for this slight discrepancy at baseline the caries experience in 8-, 12- and 15-year-old residents in fluoridated Dublin was considerably less than that in corresponding age groups in 1983, 1993 and 2002 in Northern Ireland.

Table 2.8: Mean DMFT In 8-, 12- And 15-Year-Olds In Northern Ireland (Belfast) In 1963 - 2002, And In The Republic Of Ireland In 1961-63 – 2002 (Whelton et al., 2006)

	Northern Ireland (Belfast)				**Republic of Ireland (Dublin)**			
Age	Mean DMFT				Mean DMFT			
	1963	1983	1990	2002	1961-63	1984	1993	2002
8	2.0	1.5	1.0	0.3	1.7	0.5	0.3	0.3
12	5.5	4.4	3.1	1.5	4.7	2.2	1.2	0.9
15	9.4	8.5	5.8	3.6	8.2	3.7	2.2	2.0

The data from the 2002 All-Ireland survey (Whelton et al., 2006) allowed for the first time a comparison of the dental caries prevalence in 5-year-olds who resided in non-fluoridated Northern Ireland and their peers in the water fluoridated Republic of Ireland. The data demonstrated that 5-year-old children in non-fluoridated Northern Ireland experienced considerably higher dental caries levels (dmft 2.3) than their peer who resided in water fluoridated areas in the Republic of Ireland (dmft 1.3), but very similar dental caries levels when compared to their peers who were not connected to the public water supply (dmft 2.2).

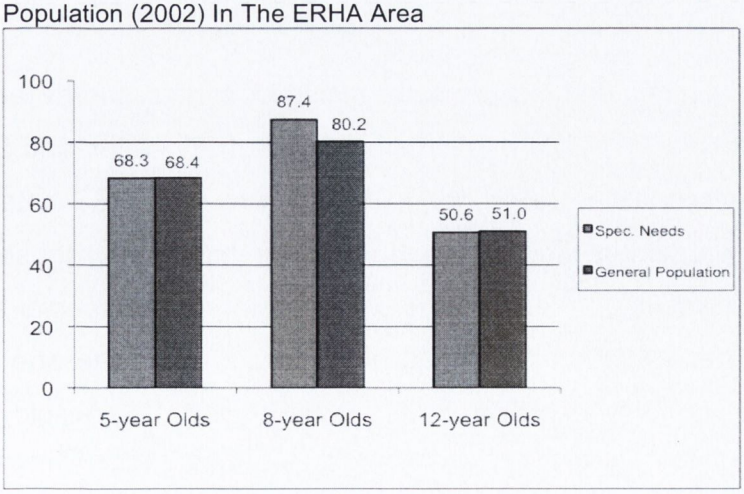
It is certainly possible that various sociological, dietary and other factors account for part of this difference, but it is reasonable to suggest that one important contributing factor is the fluoridation of the water supplies in the Republic Ireland. The data from the 2002 survey (Whelton et al., 2006) reveal a further continued improvement in dental health over time but the differences between data from residents of fluoridated and non-fluoridated areas, still favours water fluoridation. The evidence available to date suggests that while the prevalence of dental caries in Ireland in both fluoridated and non-fluoridated areas is in decline, the effect of fluoridation on dental health in Ireland appears to confer an additional benefit.

2.7 Dental Health of Young Children with Disabilities in Ireland

The Dental Health of Children in Special National Schools in the Eastern Regional Health Authority Area 1999 / 2000 (Mc Alister and Bradley, 2002 and 2003)

The Eastern Regional Health Authority (ERHA) conducted a survey of the dental health of children and adolescents attending special needs schools in their region in 1999/2000. The ERHA was established in 1999 and dissolved the Eastern Health Board, which previously provided healthcare in the counties of Dublin, Kildare and Wicklow (i.e. the wider Dublin area). The survey included schools from five of the Department of Education and Science (DES) categories of special needs schools. Schools designated as special needs by the DES are grouped into the following 11 categories: mild intellectual disability, moderate intellectual disability, physical handicap, severe/profound hearing disability, visual disability, emotionally disturbed, multiple handicaps, specific learning disabilities, young offenders, children at risk and travellers. The ERHA survey included schools for those with a mild intellectual disability, for those with a moderate intellectual disability, for those with a physical disability, for those with a hearing impairment and for those with a visual impairment. The ERHA survey demonstrated that, in general, children and adolescents attending special needs schools in the wider Dublin area (Mc Alister and Bradley, 2002) had a higher or similar levels of caries-free teeth when compared with children attending mainstream schools in the same area in 2002 (Whelton et al., 2006) (Table 2.9).

Table 2.9: Percentage Of Caries-Free Children With Special Needs (2000) And General Population (2002) In The ERHA Area



Furthermore, the ERHA survey showed that children at special needs schools had similar levels of filled teeth when compared with their mainstream counterparts.

Younger children had more teeth extracted than children in mainstream schools; however, fewer teeth were left untreated. In addition, the examined children were also found to have a high number of fissure sealants on permanent teeth, which may have contributed to the lower levels of dental decay when compared to their mainstream peers. However, Mc Alister and Bradley (2002) also reported that the findings for the group of children and adolescence with disabilities as a whole mask marked differences between the different types of special needs schools.

Oral Health of Children Attending Special Needs Schools and Day Care Centres (Whelton et al., 2009)

In 2002 the Minister for Health commissioned a study of dental health of children attending special needs schools and day care centres in the Republic of Ireland. The survey was conducted on behalf of the Minister for Health and Children by University College Cork in 2003 (Whelton et al., 2009). A random sample of 537 children and adolescents attending special needs schools and day care centres in six regions in Ireland participated in a clinical oral examination. Parents of participants also completed a questionnaire designed to assess the perceived availability, accessibility and acceptability of the oral health services for their children.

The survey examined children and adolescents aged 5, 12 and 15 years from the following two distinct special needs populations: children and adolescents attending special needs schools and those attending day care centres. Children and adolescents with special needs attending mainstream schools were not included in this study.

The majority of the children and adolescents included in this survey are from schools designated as special needs by the Department of Education and Science (DES). Special needs schools were grouped according to their DES category in schools for those with a mild intellectual disability and in schools for those with a moderate intellectual disability. In 2003, there were a total of 119 special schools catering for approximately 4500 children and adolescents within the age groups under study, the vast majority of whom are in the 12- and 15-year-old groups (Table 2.9).

Table 2.9: Number Of 5-, 12- And 15-Year-Olds Attending Special Needs Schools In The Republic Of Ireland In 2002

Category of school	Schools	5-year-olds	12-year-olds	15-year-olds	Total
Mild intellectual disability	30	56	786	1116	1958
Moderate intellectual disability	33	156	524	470	1150
Other	56	171	718	512	1401
Total	119	383	2028	2098	4509

The second populations included in the survey were children and adolescents who attend day care centres. The majority of children attending day care centres are younger children (4 to 6 years of age) with special needs who are not yet able to attend a special school. The older children attending day care centres represent the small group of children who are the most profoundly disabled and who are incapable of attending a special school. A total of approximately 500 5-, 12-, and 15- year-olds attend 47 day care centres, with over half of all these children in the 5-year-old age group (Table 2.10).

Table 2.10: Number Of 5-, 12- And 15-Year-Olds Attending Day Care Centres In The Republic Of Ireland In 2002

Category of school	Schools	5-year-olds	12-year-olds	15-year-olds	Total
Day Care Centres	47	284	99	111	494

The survey was conducted in the following six health board regions in the Republic of Ireland: Midlands, Mid-Western, North-Western, South-Eastern, Southern and Western. A total of 245 children attending 27 day care centres and 790 children attending 45 special schools were selected, giving a total sample size of 1035. Because the survey returns were considerably lower than the anticipated, the initial sample required a top up of children and adolescents. In total, 653 (63%) children had the consent of their parents/guardians to participate in the survey. Of these 653 children only 537 (82%) participated on the day of the clinical examination, 65 children (10%) were absent on the examination day and 51 children (8%) could not be examined due to an inability to co-operate under field conditions (Table 2.11).

Table 2.11: Distribution Of Children Examined By Age Group And School Category

Category of school	5-year-olds	12-year-olds	15-year-olds	Total
Day Care Centres	55	9	17	81
Special Needs Schools:	40	223	193	456
Mild Intellectual Disability	2	89	82	173
Moderate Intellectual Disability	37	76	61	174
Others	1	58	50	109

The clinical examination of 5-year-olds revealed that the percentage of children with no caries in their primary dentition (dmft=0) was highest for those attending schools for moderately intellectually disabled children (73.0%). Approximately 65.5 percent of those attending day care centres had no dental caries. Both special school categories had a higher percentage of caries free children than their peers in the general population living in fully fluoridated areas in the Republic of Ireland in 2002 (63.1%). The mean number of decayed, missing or filled primary teeth (mean dmft) was similar among all subgroups 5-year-olds with 1.4 for the moderate intellectual disability school category and 1.3 for both children attending day care centres and 5-year olds in the general population (Table 2.12).

Table 2.12: Mean dmft In 5-Year-Olds Attending Day Care Centres And Special Needs Schools And 5-Year-Olds In The General Population In The Republic Of Ireland In 2002

Category of school	Total	dmft	dt		mt		ft	
	N	Mean (SD)	Mean	%	Mean	%	Mean	%
Day Care Centres	55	1.3(2.6)	1.1	88	0.1	6	0.1	6
Moderate Intellectual Disability	37	1.4(2.8)	1.0	68	0.3	19	0.2	13
General population	3614	1.3(2.3)	1.1	83	0.2	11	0.1	6

While 73 percent of 5-year-olds attending schools for moderately intellectually disabled children were caries free (dmft=0), 19 percent of these children had a dmft score of four or more; this includes eight percent who had a dmft score of eight and three percent with a dmft score of nine or more. This compares to 66 percent caries free amongst children attending day care centres, but only nine percent of this group had a score of four or more (2% with dmft=8 and 7% with dmft=9 or more). Table 2.13 gives an overview on the dmft distribution between the three subgroups of 5-year-olds.

In addition to the clinical examination parents/guardians of participants also completed a questionnaire designed to assess the perceived availability, accessibility and acceptability of the oral health services for their children. The level of utilization of the dental services currently available to 5-year-old children

with special needs was recorded as part of the questionnaire. Thirty-five percent of children in the 5-year-old group had never been to a dentist, while just over half had their first visit to a dentist before reaching the age of 5 years. In this age group, the most commonly stated reasons for never having been to a dentist were that the child had never complained of toothache, that the child had no problems or need for treatment or that the child had not yet been called by school dentist.

However, few parents of children with special needs reported problems getting dental treatment for their child. Those who did report problems tended to be parents of children with more severe disabilities, the main problems being that the child could not be treated locally and had to be referred to specialized service, or that the child was un-cooperative/nervous of treatment. In addition, parents of children with more severe disabilities expressed a higher level of dissatisfaction with the amount of information available on oral health care provision than parents of children with less severe disabilities.

2.8 Dental Health of Young Children with Disabilities in Developed Countries

Survey data on the level of dental health in pre-school children with disabilities in developed countries are scarce. Current studies only report the dental health of school-aged children with disabilities, but even for this older age-group, the information on individuals with severe intellectual disabilities limited. However, some studies suggest that children and adolescents with intellectual disabilities have poorer oral hygiene and a higher prevalence of dental health problems when compared to the general population (Evans et al., 1991; Nunn et al., 1993; Shaw et al., 1986). Some research data have demonstrated that children with disabilities generally receive less restorative care than the general population (Bradley et al., 2004; Desai et al., 2001; Maclaurin et al., 1985; Mitsea et al., 2001) and that almost 80 percent of children with disabilities have untreated caries (Gizani et al., 1997).

Evans et al. (1991) undertook an epidemiological study involving 677 children and young adults aged between three and 19 years who attended special schools in Wales. The results showed that 5-year-old children with disabilities were found to have a mean dmft of 4.18, which was significantly higher than that of similar aged children without a disability who attended mainstream state schools.

Another study that included data on young children, assessed the dental health status and treatment needs of a child population in the Netherlands. De Jongh and

co-workers (2008), in their sample of 61 children aged between four to 12 years drawn from seven randomly selected day-care centres found that the majority of the children had been examined visually, but the degree of cooperation for this oral examination was, in most patients, poor. 57.4 percent of the sample showed untreated dental caries (mean dmft/DMFT = 3.0; SD = 3.1) and the proportion of caries-free children was 29.5 percent. On the other hand, Hennequin and co-workers (2008) found in their study on dental health inequalities in children with disabilities that in a representative sample of six to 12-year-old French children who attend special needs schools, approximately 90 percent were found to be caries-free.

Milsom and co-workers (2009), in their cross sectional epidemiological survey of the dental health and socioeconomic status of 5-, 12-, 14-year old children with a Statement of Educational Special Needs in North-West England, highlighted the substantial recruitment difficulties of participants. Overall, only 34 percent of the parents agreed to allow their children to participate in the study. The results suggest that participation in dental epidemiological studies amongst children with special needs is a problem and that the difficulty of recruitment is particularly acute amongst children from disadvantaged backgrounds. However, the dental health among the examined young children with a disability was similar to that of children and adolescents of the same age group without a disability. The authors identified in their study the need to develop methodologies that will encourage wider participation in dental health surveys of children and adolescents with special needs.

Slack-Smith et al. (2009) examined total population data for Western Australia, which link midwives' information with birth defects, intellectual disability, hospital admissions and deaths. Children born 1980–1995 (n = 383,665) were followed until the age of five years. They found, in their study on dental admissions in pre-school children, that children with an intellectual disability and children with birth defects were more likely to have had a dental admission. Furthermore, children living in a region without fluoridated water were also more likely to have had a dental admission. The authors concluded that their findings highlight the need to orientate dental care towards oral examinations by the first birthday and active prevention supported by a range of health professionals. Furthermore, they suggest a determination of what health services children in the highest risk groups, i.e. children with an intellectual disability and children with birth defects, access

and to encourage in the early years prevention and early dental visits in order to decrease the need for dental admissions.

Aims and Objectives of the Study

Aims This Study:

- Measure the dental health status of a sample of pre-school children with disabilities in the Republic of Ireland
- Determine the effectiveness of an early intervention programme with parental education, followed by intensive, evidence-based clinical prevention and dental treatment.forpre-school children with disabilities.

Objectives of This Study Were To:

- Develop a secure mobile, online data collection system for use in oral epidemiology;
- Compare and contrast dental health status in a sample population of pre-school children with disabilities who received early intervention with parental education, followed by intensive, evidence-based clinical prevention and treatment with that of a matching control group;
- Describe dental health behaviour, attitudes and knowledge of parents / caregivers of pre-school children with disabilities by use of a questionnaire;
- Describe referral patterns for oral health education and/or preventive treatment of oral health professionals as part of the early intervention programme;
- Use qualitative research techniques to describe and interpret parents' / caregivers' view of their children's oral health care needs and parental coping strategies;
- Use qualitative research techniques, to describe and interpret parents' / caregivers' view of barriers to participation in the present study and to access oral health services for pre-school children with disabilities.

Chapter 3 Material and Methods

3.1 Secure Online Data Collection System

Before commencement of the development of a dedicated secure online data collection system the principal investigator (DS) agreed with the supervisor of the present study (JN) on the following primary requirements for the data collection system based on the experience with a pilot application for online data collection available in the Department of Public and Child Dental Health (School of Dental Science):

- Direct data entry in order to eliminate chances of error associated with processing data from paper to an electronic format;
- Highest levels of data security;
- Portable data entry devices;
- User-friendly;
- Ease of access to data for examining teams;
- Affordability.

Furthermore, the secure online data collection system needed to adhere with all legislation covering data protection when collecting, handling and reporting on data. The relevant legislation was:

- Data Protection Act 1988 (Government of Ireland, House of the Oireachtas, 1988);
- Data Protection (Access Modification) (Health) Regulations, 1989, (S.I. No.82 of 1989) (Government of Ireland, House of the Oireachtas, 1989);
- Data Protection (Access Modification) (Social Work) Regulations, 1989, (S.I. No.83 of 1989) (Government of Ireland, House of the Oireachtas, 1989).

After preparation of a detailed protocol on the requirements and design of the decicated secure online data collection system the principal investigator consulted with an senior software engineer (Garry Donnelly, GD), experienced in the development of secure banking software. It was the software engineer's resonsibility to programme the software application and to provide maintanence service during the duration of the study.

The application for the secure online data collection was developed entirely as an open-source software solution. There were several benefits to open-source software, in particular security reasons that lead to this approach. In a process similar to peer review open-source software codes are analysed, audited, and

vetted by dozens, hundreds, or even thousands of concerned practitioners. Bugs and other aberrations can be quickly discovered and patched, creating a substantial disincentive for programmers to place malicious code in their programs. Furthermore, in the present study only open-source software components were used which were well established, widespread used and had a proven record of stability in software engineering.

During the duration of the study the the principal investigator (DS) consulted on a regular bases with the software engineer (GD) in order to improve the usability of the application based on the experince gained while conducting the fieldwork.

3.2 Sample

There is currently no accurate information on the numbers of pre-school children with disabilities available in the Republic of Ireland. Current literature only provides an outline of the prevalence of disabilities in young children in the Republic of Ireland. For example, Kelly and co-workers (2008) noted in there report, which was based on the records collected on National Intellectual Disability Database (NIDD), that registration on this database is voluntary and an under-representation of young children with an intellectual disability is apparent. In addition, commonly cited prevalence rate of between three and four persons with severe intellectual disability per 1000 is an average across different studies based on varying methodologies and using diverse definitions of this condition (Emerson et al., 2001). But even within countries, variations are reported in the prevalence rates. Harker (2003) estimated for the United Kingdom that around 5.00 per 1000 adult persons in England required intellectual disability services. In Wales, 4.3 persons aged 16 years and over were known to local authorities in 2003 (Felce, 2004) whereas in parts of Northern Ireland, rates of up to 9.04 per 1000 have been reported (McDonald and Mackay, 1996). Furthermore, even if data had been published a distinction must be drawn between an administrative prevalence, i.e. persons known to services and a 'true' prevalence of persons with disabilities (Roeleveld et al., 1997). There are indications that rates based on total population screening tend to be higher (Emerson et al., 2001). However, in affluent societies with national coverage of services, it is likely that administrative prevalence rates are coming closer to the true prevalence for persons with severe disabilities. Bearing these uncertainties in mind, an estimation strategy for planning and management of the present study was developed based on Department of

Education and Science and 2002 census data (Central Statistics Office Ireland, 2003) with the aim to avoid any underestimation of the potential participation level. Department of Education and Science data demonstrated that approximately 667 5-year olds with disabilities were attending special needs schools (383 children) and day care centres (284 children) in 2002. The available Census 2002 data do not provide a county breakdown of the 5-year old child population in the Republic of Ireland. However, assuming a broadly similar distribution as the general population, approximately 8.8 percent of the 5-year olds may reside in the HSE North-East and approximately 9.65 percent may reside in the HSE South-East. Applying this distribution to the 5-year olds with disabilities will result approximately 58.7 5-year olds with disabilities living in the HSE North-East and approximately 64.4 5-year olds with disabilities living in the HSE South-East. This leads to a linear extrapolated estimation figure of 352.2 pre-school children (0-6-year olds) with disabilities in the HSE North-East and 386.4 pre-school children with disabilities in the HSE South-East. However, it has to be noted that these estimates are only made for logistical planning, i.e. preparation of examination kits, arranging dental surgeries etc. The real number of pre-school children with disabilities in the two regions remains unknown and may well be far below these estimates as they are based on 5-year olds, i.e. the older end of the age range where diagnosis level are expected to be higher than in the younger age groups. Current literature demonstrated that the majority of persons with a disability are considered to have a cognitive disability. However, a sizable number of pre-school children, in particular the younger children, may not yet have been diagnosed with a disability yet and therefore remain uncounted. Furthermore, it has been anticipated that the number of new registration may fluctuate over the duration of this longitudinal study due to diagnostic and administrative constrains within the health service. Based on these considerations, a dental epidemiological study was conducted in two HSE administrative areas, HSE North-East (i.e. local health offices in Cavan/Monaghan, Louth and Meath) and HSE South-East (i.e. local health offices in Carlow/Kilkenny, South Tipperary, Waterford and Wexford). Figure 3.1, Figure 3.2 and Figure 3.3 show the boundaries of the two HSE administrative areas. Only pre-school children with disabilities aged 0-6 years at the time of the first examination were selected as the study population.

Figure 3.1: Boundaries Of HSE North-East And HSE South-East (Google Earth, 2010)

Figure 3.2: Boundaries Of HSE North-East (Google Earth, 2010)

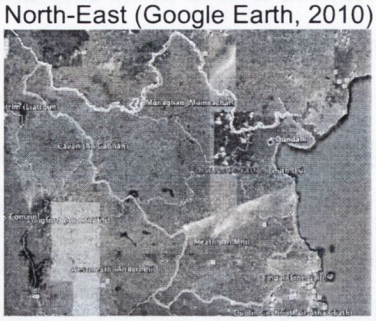
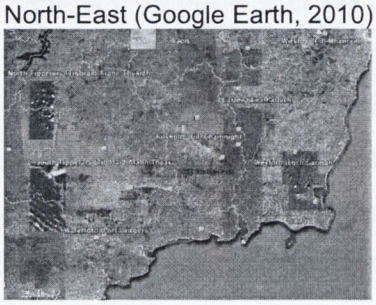


Figure 3.3: Boundaries Of HSE North-East (Google Earth, 2010)



3.3 Definition of Age

The age of the children is defined as the chronological age in years at the date of the clinical examination.

3.4 Sampling and Procedures

Families were continuously recruited by the Early Intervention/Enable Ireland Services in the two selected regions for inclusion in the study. Enable Ireland is a voluntary service provider, which delivers disability services for children and adults on behalf of the HSE. All families already registered with the Early Intervention/Enable Ireland Services in the selected regions or who came on the register during the study period were invited to participate in the study.

In addition, in HSE North-East an evidence-based oral health promotion resource pack for use by all health professionals working with pre-school children with disabilities, developed by a local multidisciplinary group of health care providers to young children with disabilities, was facilitated. In the HSE North-East region, caregivers of pre-school children with disabilities were provided by oral health promotion teams with key oral health messages and a supportive dental environment. As part of this initiative, the children were assessed by a senior dental surgeon and an individual preventive plan was developed.

3.5 Consent

Permission to carry out the study was obtained from the HSE in the North-East and HSE South-East region and the principal dental surgeons (local senior HSE oral health care managers) in the respective areas. The Pprincipal Dental Surgeons of those areas were provided by the Early Intervention/Enable Ireland Services with contact details of all families with pre-school children with disabilities registered with their service. The Principal Dental Surgeons in the HSE South-East then asked the child's legal guardian for written consent to allow forwarding the child's details to the principal investigators in order to allow them to arrange for an oral examination of the child and to interview the parent / caregiver by use of a questionnaire. At the appointment for the oral examination a second consent form for the oral examination was given to the accompanying parent / caregiver. All parent / caregivers of participating children were fully informed regarding the nature of the study and the benefits of participating. This was a cross sectional survey and there were no risks associated with participation.

The present report only includes results for those children with completed clinical examinations and questionnaires.

All children who participated in this study were rewarded at the last visit with a €15 gift voucher after completion of the clinical examination and questionnaire.

3.6 Training Calibration of Examiners and Recorders

Four clinical examiners (dentists), including the principal investigator of the present study, and recorders (dental nurses) were trained and calibrated prior to the commencement of the fieldwork. Prof. June Nunn provided the standard against which the examiners were calibrated. Prof. June Nunn had previously participated in various Irish and international dental health studies and surveys. The initial training and calibration programme took place on 30.06.2006 at HSE Navan Dental Service (HSE North-East). The first part of the training exercise consisted of a series of seminars on the measurement indices, which were to be used. The examiners then recorded clinical conditions from a series of slides. The second part of the training was a practical exercise in order familiarise the examiners with the tablet-PCs and the online data collection system. The examiners examined a series of selected subjects and recorded the clinical details, which were subsequently discussed with the trainers.

The level of agreement between the examiners and the gold standard was assessed by use of the Kappa statistic, as described by Fleiss and Chilton (1983). The level of agreement between the examiners and the gold standard was calculated and showed an agreement of kappa = 0.91 for the dental caries measurement and an agreement of kappa = 0.83 for the DDE Index.

Follow-up training and discussion sessions or telephone briefings were held in regular intervals (approximately every six months) or when a question or problem arose in order to ensure consistency with the measurement indices and to address all arisen issues while conducting the study.

The principal investigator of the present study (DS) was responsible for clinical examinations and questionnaire data collection in the HSE South-East whereas in the HSE North-East all quantitative data was collected by three HSE employed senior dental surgeons as part of their work in the provision of dental services for children with disabilities.

3.7 Ethical Approval and Data Protection

The Trinity College Faculty of Health Sciences Research Ethics Committee (Chairperson: Dr O. Shiels; School of Medicine, Chemistry Building, University of Dublin, Trinity College, Dublin 2) reviewed the protocols for training and calibration of the examiners and for the main study. The committee approved the study on the 15. May 2005.

The HSE North Eastern Area Research Ethics Committee (Chairperson: Dr B. MacMahon; HSE North Eastern Area Research Ethics Committee, Area Office, Dublin Road, Kells, Co Meath) approved the study on the 21. April 2005. The HSE South-Eastern Area Research Ethics Committee (Chairperson/Co Chair: Dr Foley-Nolan / Dr E. Tierney; Research Ethics Committee Office, Old School of Nursing, Waterford Regional Hospital, Dunmore Road, Waterford) approved the study on the 20. June 2005.

All collected data for this study are confidential, i.e. it is not possible to match the dental health status and questionnaire with an individual child. All standard confidentiality procedures were followed. Legislation covering data protection was adhered to when collecting, handling and reporting on any collected data.

3.8 Funding

This study was funded by the Health Research Board (HRB). HRB Grant Reference: RP/2004/115.

3.9 Examination Kit

The examination teams were equipped with:

- an examination kit, including a plain mouth mirror head with a fibre-optic light (Appendix B) and a ball-tipped CPITN probe;
- face mask and examination gloves;
- a printout of the instructions on the day-to-day administration of the fieldwork and logbook;
- a touch-screen tablet-PC for secure electronic data collection (i.e. clinical data and questionnaire) and secure online data submission.

3.10 Cross Infection Control

Gloves were changed before the examination of every subject. Facemasks were changed every hour. A disposable paper sheet was used under each set of instruments and disposed of after each subject. The used single-use disposable mirror heads were disposed immediately after each examination. Light handles were wiped with disinfectant wipes between subjects. A clinical disposal plastic bag (yellow bag) was brought for disposal of used gloves, wipes, clinical sheets and single-use mirror heads.

3.11 Clinical Waste Disposal

All clinical waste was collected on a day-to-day basis and appropriately disposed at the HSE dental clinic where the examination took place.

3.12 Data Measurement and Recording

Data collection and recording followed a uniform protocol in order to insure standardised and identical examination conditions.

3.12.1 Questionnaire

A standardised questionnaire was administered to the caregivers' in form of an interview prior the clinical examination (Appendix C) and the results were

immediately entered on to secure electronic database via a tablet-PC. The questionnaire was structured in different sections to answer questions on:

- behaviour and attitudes to dental health and dental health care;
- dental health knowledge;
- oral hygiene habits.

3.12.2 Examination Sequence and Clinical Conditions

All indices were examined in all subjects. The clinical examination took place in dental surgeries. The examiner was seated next to the subject who was in a supine position on a reclined dental chair or the caregivers lap. A schematised electronic record sheet (Appendix D) on the tablet-PC was used to record the data on the following clinical conditions:

Examination Sequence

1. Tooth Presence
2. Crown Status (including dental caries and presence of fissure sealant)
3. Dental Erosion
4. Development Defects of Enamel
5. Dental Trauma
6. Periodontal Assessment (Treatment needed)

Children were only examined for dental caries, which had extended through the tooth enamel and into dentine, using the dmft index. This measurement counts the number of teeth, which are decayed [d], missing (i.e. extracted due to caries) [m], or filled due to caries [f]. World Health Organization (WHO) examination criteria are used in the present study (World Health Organization, 1997). These criteria dictate that only dental caries at cavitation level should be recorded. The notation for this type of cavitated caries is d_{3c}mft for primary teeth - the '3' indicates that caries is recorded at the dentinal level of involvement and the 'c' indicates that the lesion has cavitated. An additional reason only to record dental caries at cavitation level is that this level of dental caries is considered to produce non-ambiguous results in the present sample population, which may have limited ability to co-operated while conducting the examination. A ball-tipped CPITN probe was used to remove plaque and to help confirm diagnosis of cavitation.

Appendix E presents the examination criteria in detail. All clinical data were directly entered on to the secure electronic database via a tablet-PC.

3.12.3 Referrals in the HSE North-East

In the HSE North-East, a cornerstone of the piloted oral disease prevention programme for pre-school children with disabilities was the provision of oral health education and / or preventive treatment depending on the outcome of a comprehensive assessment, which was part of the clinical examination. Children who were deemed to benefit from parental oral health education, preventive procedures and / or a course of dental treatment were referred by the examiner after the examination to the most appropriate professional. A referral form (Appendix F) was used to collect information based on a dental caries risk assessment (Table 3.1), which was already established in the HSE North-East, and provided additional referral information (patient details). The dental caries risk assessment criteria had been previously developed in the HSE North-East in order to address local needs and to appreciate local circumstances appropriately and was adopted in the present study.

Table 3.1: HSE North-East Dental Caries Risk Assessment Criteria

	High	Medium	Low
Diagnosis / Condition	-Down Syndrome (Perio) -Mild Learning Disability -Severe Learning Disability -Physical Disability	-Cystic Fibrosis	-Autism -Down Syndrome (caries)
Medication History	-Frequent prescribed medication containing sugar -Frequent OTC medication containing sugar	-Infrequent prescribed medication containing sugar -Infrequent OTC medication varied	- Infrequent prescribed medication containing sugar -No medication containing sugar -Infrequent OTC medication varied
Dietary History	-Frequent ingestion of sugar containing food and drinks (> 4 day) -Peg feeding / Reflux -Tube feeding -Supplemental feeds containing sugars -High calorie intake with sugar containing foods / drinks. -Feeding difficulties -Swallowing difficulties		-Healthy diet with low sugar intake
Fluoride Toothpaste Status	-No fluoride toothpaste use at all -Toothbrushing infrequently or not at all, not assisted or supervised	-Assisted brushing not daily -Toothbrushing infrequently i.e. not daily -Use of children's toothpaste	-Use of pea sized amount of standard toothpaste twice a day. -Supervised, assisted toothbrushing.
Clinical Examination	-Primary dental caries. -Early Childhood Caries -Developmental anomalies -Poor OH Untreated Trauma (Code 2 to 4)	-Abnormal teeth morphology -Medium OH -Fair OH -Trauma Code 1/E	-Normal teeth morphology -Caries free -Good OH -Trauma Code 0

3.13 Data Entry and Analysis

Clinical data and questionnaires were entered on to secure electronic database via a mobile touch-screen tablet-PC from multiple examination sites. Data analysis files were built and the data checked and cleaned. An encrypted central database provided secure persistent storage on a dedicated server. Backup disks of all data were maintained. The data was analysed by using:

- Mann-Whitney or Kruskal-Wallis test. Both are non-parametric tests, which were used to compare unpaired groups;
- Fisher's Exact Test, a test for independence in a 2x2 table, when the total sample size and the expected values were small;
- McNemar's Test, to test the difference between paired proportions.

3.14 Geocoding and Application of the SAHRU Deprivation Index

All addresses entered on the database were geocoded with the GeoDirectory software for the Republic of Ireland. This process located an address geographically and allowed the identification of its electoral division (ED). The identification of the ED where the individual child lives allowed classification of the child's living environment into deprived or non-deprived areas according to the SAHRU Deprivation Index (Kelly and Sinclair, 1997, 2007), which was used as an indicator for material deprivation. The current version of the SAHRU Deprivation Index (Kelly and Sinclair, 2007) uses four census based indicators (2006 census), which are widely believed to represent or be a determinant of material disadvantage. These were:

- Unemployment;
- Low social class;
- No car;
- Rented accommodation.

A detailed discription of these census based indicators can be found in Appendix G. Results for these four indicators were produced on 3,409 EDs as part of the Small Area Population Statistics (SAPS) based on the 2006 census results and subsequently used to construct the latest version of the SAHRU Deprivation Index (Kelly and Sinclair, 2007). This social classification model (deprived or non-deprived EDs according to the SAHRU Deprivation Index) was subsequently used to further analyse of the clinical data in order to investigate if correlations between material deprivation (i.e. living in an area of deprivation) and clinical findings exist.

The geocoding and matching process was performed according to the following methodology:

Structured Matching

Addresses were processed from right to left. As each element of an address was identified and therefore the universe of potential matches reduced. Thus, when the town has been identified, the only streets that can possibly match are associated with that town.

Unique Irish Pattern matching algorithm

An algorithm that handles differences in the spelling of Irish place names was used in order to identify unique Irish address names. Table 3.2 provides examples where the alogrithem was used.

Table 3.2: Examples For Identification Of Irish Address Names

Allowed Match	Rule
St Anne Terrace = St Annes Terrace	Extra 's' on word
Old Town = Oldtown	Missing space
Parteen Road = Patreen Road	Reversed letters, not first letters
Phibsboro = Phibsborough	Ending in 'ough' instead of 'o'
Charleville = Rathluirc	Matches to an alias

Manual Geocoding

After the address matching software exhausted all rules for matching an address, and still a match was not identified, manual geocoding was employed in order to identify the remaining addresses.

Matching Identified ED with SAHRU Index

After identifying each child's ED, the SAHRU Index was used to determine if a child lives in a deprived area.

3.15 Qualitative Research

Qualitative research techniques were used along with quantitative methods in order to assist to interpret and better understand the complex reality of oral health levels and the implications of quantitative data. Two moderators / interviewers (Janine Owens (JO), University of Sheffield, and the principal investigator (DS) of the present study) undertook the qualitative research. JO acted as the senior researcher in this part of the present study.

Qualitative research in coping strategies of parents / caregivers of children with disabilties was undertaken in the HSE South-East as these parents were not exposed the oral health prevention programme and therefore their views may not

have been unconsciously biased by the learning experience of the prevention programme.

Non-response analysis was undertaken in parents / caregivers from both regions.

3.15.1 Emic and Etic Data

Emic and etic data is a distinction borrowed by anthropologists from linguistics. Emic data occurs naturally without any imposed structure, whereas etic data occurs through the researcher's rigidly imposed view of the issue and a structure is placed around the situation which constrains the emergent data. The emergent data from the focus groups lies at the emic end and this is largely related to the moderators allowing the conversation to flow with little or no interruptions; leaving the parents / caregivers to discuss issues that they felt important (Berry, 1989).

3.15.2 Moderating the Focus Groups

A focus group methodology was selected for the investigation in coping strategies of caregivers of children with disabilities. The approach in these focus groups was non-directive in order to enable group interaction and provide greater opportunity for individual views to emerge through promoting group sociability (Pope and Mays, 2006). Furthermore, the senior moderator (JO) employed occasionally a narrative and worked form a stance of inclusion, which had the advantage of providing a validity check on the researcher's understandings of the issues and their contextual significance. However, these particular groups were carried out with minimal intervention from the two moderators, and when interjection was necessary it was only for clarification that they understood a context correctly, to raise another topic for discussion, or to enable another group member to speak.

3.15.3 Individual Interviews

Semi-structured interview rather than focus group methodology was selected for the non-response analysis, because of the difficulty in arranging for the participants to gather in one place. Interviews can also assist respondents in speaking freely (Fontana and Frey, 1994). The interviews were semi-structured to allow flexible data collection so that emergent issues could be explored alongside discussion of the key themes (Britten, 2000).

3.15.4 Participation

The two moderators / interviewers (JO and DS) were keen to cultivate a high level of participation. To ensure this, focus group members and interviewees were made to feel as if their views are important, valued and necessary for the success of the research. All focus group members were encouraged to speak and if one member was unusually quiet he/she was asked if he/she agreed or if he/she had a different experience that he/she thought may shed more light on the situation. The moderators / interviewers looked carefully for non-verbal cues for group facilitation and participation by focus group participants and interviewees such as facial expressions, body language and looking to the moderators / interviewers for reassurance (Pope and Mays, 2006; Ritchie and Lewis, 2003).

3.15.5 Probing

In order to clarify and develop themes the two moderators / interviewers probed deeper to elaborate abstract themes that the focus group discussed or the interviewee raised. For example, saying that services are inaccessible could mean many things like being hard to access by telephone, difficult to reach geographically, or that attitudes are a barrier. Probing is vital to extract full information from participants, and the moderator's counselling and listening skills were used to enable people to articulate their thoughts and feelings (Ritchie and Lewis, 2003; Pope and Mays, 2006).

3.15.6 Analysis and Development of Themes

The design of this research is not complex and therefore analysis was interpretivist in its approach and moves towards the phenomenological, which explores peoples lived experiences, commonalities and shared meanings. The stories that each individual drew upon was used as the basis for the narratives and the deriving themes. All sessions were audio taped with the consent of the participants. The tapes were then transcribed verbatim for analysis (Pope and Mays, 2006). After transcription, the common themes that developed in each group and interview were identified. The process was one of immersion and the senior moderator / interviewer conducted a thematic analysis of the focus group, interviews and observational data. The identified themes were then arranged into meaningful categories and all the data was analysed in the original language used by the participants to preserve their original meanings.

3.15.7 Interviewing Method

A narrative approach to interviewing was employed in order to unpick the many layers of subjective meanings within parent's stories. This approach is well suited to discovering the confusions, ambiguities and contradictions that are a part of everyday experience (Plummer, 2001). All interviews were tape recorded with the permission of the interviewees and tapes were destroyed immediately after transcription. Only the interviewers are aware of the identities of the interviewees and any personal identifying characteristics had been altered so that they are not directly traceable to the individuals concerned.

The full content of the stories will remain private and unavailable for general consumption. The senior interviewer was part of the interview situation whereas the second interviewer acted as an observer in order to ensure comprehensive data capturing. The senior interviewer was guided by ethnographic principles, recorded her thoughts, feelings and observations after the interviews as field notes and discussed them with the second interviewer. This process involves a high degree of reflection to understand and separate emergent feelings, transferred during interactions with other people, from ones own feelings (Rogers, 1980).

3.15.8 Methodological Rigour

The methodological rigour of this part of the study is supported by the credibility, dependability, veracity, fittingness, confirmability, and saturation tests in qualitative research (Guba and Lincoln, 1981; Guba and Lincoln, 1992; Mays and Pope, 1995). Credibility, fittingness and confirmability are promoted through the two moderator's time spent with parents of children with disabilities in their world, which enables insight into the context of the parent's experiences. At the end of the focus groups a summing up of the issues discussed was presented to the group to either confirm or add to the representations that the moderators had gained throughout the discussions. Additionally, the level of expertise possessed by the senior moderator through working and researching with parents of children with disabilities and in depth academic knowledge, triangulation of the data with existing accounts and with emergent data, coupled with in depth clinical knowledge from the second moderator lent support to the credibility of the findings.

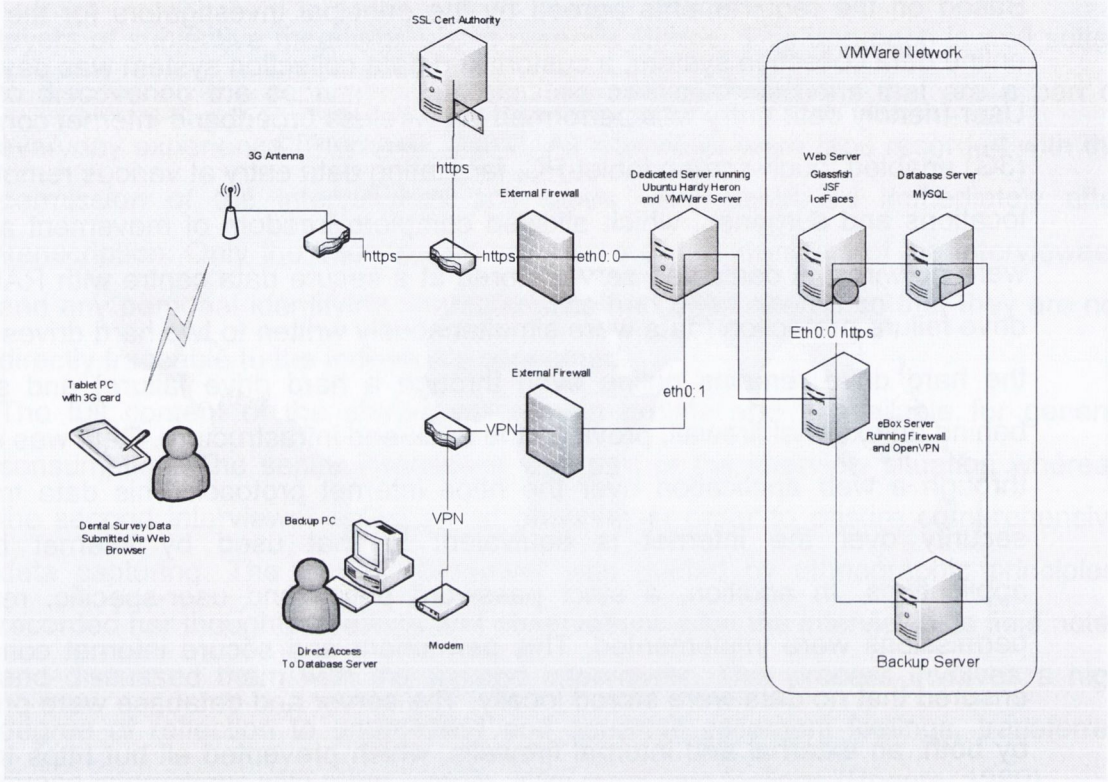
Chapter 4 Results

4.1 Development of a Secure Online Data Collection System

Based on the requirements agreed by the principal investigators for the secure online data collection system, a customised data collection system was developed. User-friendly data entry was performed via wireless broadband internet connection (3G) enabled touch-screen tablet-PC, facilitating data entry at various remote clinic locations and surgeries, which allowed complete freedom of movement as there were no wires. A dedicated server stored at a secure data centre with RAID hard drive failure protection (data were simultaneously written to two hard drives so that the hard drive remains online even through a hard drive failure) and secured behind an external firewall, provided the back-end infrastructure. Data was entered through a web application over the https internet protocol. This data transport security over the internet is equivalent to that used by internet banking applications. In addition, a strict password policy and user-specific, restricted permissions were implemented. This permanent and secure internet connection ensured that no data were stored locally. The server and database were protected by both, an external and internal firewalls, which prevented all but https traffic to the web application and VPN to the database server. This dedicated server ensured that no one but the research team had access to the server. The encrypted database provided secure persistent storage on the server. Daily local database backups were produced. In addition, weekly remote database backups were produced as well. The front end was built on an entirely open-source software solution. Ubuntu (Canonical Ltd. / Ubuntu Foundation, London, UK) was chosen as the operation system, VMWare Server (VMWare Inc., Palo Alto, USA) for virtualisation allowing hardware independence and machine snapshots, eBox Platform for firewall and OpenVPN (OpenVPN Technologies Inc., Pleasanton, USA) access, Glassfish (Oracle Sun Microsystems Inc., Redwood Shores, USA) was the enterprise application server, JavaServer Faces technology (Oracle Sun Microsystems Inc., Redwood Shores, USA) was the web framework utilizing IceFaces (ICEsoft Technologies Inc., Calgary, Canada) and was aided by custom javascript. The back-end database was facilitated by a MySQL (Oracle Sun Microsystems Inc., Redwood Shores, USA) database server. As this solution allowed direct data entry, continues data validation was performed through an automated process, which increased the accuracy of the entered data. Data was downloaded by permitted users only in CSV file format for statistical analysis.

Figure 4.1 provides a network diagram of the secure online patient data collection system.

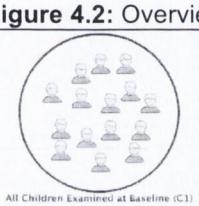
Figure 4.1: Network Diagram Of The Secure Online Patient Data Collection System



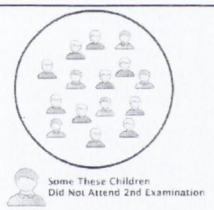
4.2 Quantitative Research

Due to the longitudinal research aspect of the present study a multilayered analysis plan was developed. Figure 4.2 explains the rationale for the analysis plan and gives an overview of the steps followed in the analysis of the quantitative data. Over the duration of the study all newly registered children (with the Early Intervention Team/Enable Ireland) were continuously invited to participate in the study i.e. baseline examination results were continuously collected over the three-year period. Furthermore, all children were invited to attend follow-up examinations at intervals of approximately 12 months, which resulted in a maximum of three examinations of children who were examined in the first year of the study and who attended all offered subsequent examinations.

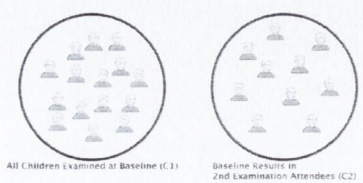
Figure 4.2: Overview Of Conceptual Structure Of The Analysis Of The Quantitative Data



All children included in the present study were at least examined once (i.e. were included in the group of baseline participants, referred to as 'C1').

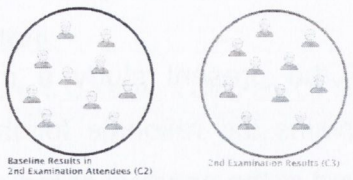


However, some of these children did not attend any of the subsequent examinations and therefore were not included in any longitudinal analysis. Furthermore, it is possible that those who decided to continue to participate did so, because they had a particular concern about their child's dentition. In this case the results may overestimate disease levels of the population. However, it is also possible that those more educated and interested in their children's health decided to participate regardless of their child's needs. As the present analysis is undertaken retrospectively, children who did not attend a subsequent examination could be identified and therefore the risk of any bias minimised.



Therefore, a subgroup of children was created, which excluded children who did not attend a subsequent examination (referred to as 'C2' in this example).

In order to ensure that these children, who attended a subsequent examination (C2) still represented disease levels found the whole sample (C1), a comparison of disease levels between these two groups of children was first performed.



Only after this comparison was undertaken, longitudinal analysis of data collected at different points in time was performed. In this example, baseline results (C2) were compared with 2nd examination results (C3) in the same children.

The same procedures were followed when comparison of 2nd examination and 3rd examination results wascarried out. Firstly, 2nd examination results from all children (C3) were compared with 2nd examination results from children who attended the 3rd examination as well (C4). Then the 2nd examination results were compared with the 3rd examination results found in the same children.

4.2.1 Demography

4.2.1.1 Sample

A dental epidemiological study was conducted in two HSE administrative areas, the HSE North-East (i.e. local health offices in Cavan/Monaghan, Louth and Meath) and HSE South-East (i.e. local health offices in Carlow/Kilkenny, South Tipperary, Waterford and Wexford). Only pre-school children with disabilities aged 0-6 years at the time of the first examination were selected as the study population. Families were recruited by the Early Intervention/Enable Ireland Services in the two selected regions for inclusion in the study. All families registered with the Early Intervention/Enable Ireland Services in the selected regions were invited to participate in the study.

The HSE North-East dental service had access to families registered with the Early Intervention/Enable Ireland Services and could contact caregivers directly. Oral health promotion teams provided parents / caregivers of these children in the HSE North-East with key oral health messages and a supportive dental environment. As part of this programme, the children were assessed by a senior dental surgeon and provided with preventive and dental treatment if required as well.

The Early Intervention/Enable Ireland Services provided the HSE South-East dental service with contact details of all families with pre-school children with disabilities registered with their service. The HSE South-East dental service had then to ask the child's legal guardian for written consent to allow the forwarding of the child's details to the principal investigators, in order to arrange for an oral examination of the child and to interview the caregiver by use of a questionnaire.

Out of a total of 546 contact details forwarded for participation in the study, 422 (77.3%) children attended one or more individually arranged appointments. Of these 422 attendees, 346 datasets (82.0% of the attendees) were included in the present study. Seventy six (76) datasets were excluded from the present analysis due to insufficient / incomplete information. However, it is anticipated that currently missing information will be included in the database over time as arrangements have been made to continue to invite children who either were not co-operative enough to undergo a full oral examination at the time of the appointment or were not yet able to attend for the examination.

Out of the 346 in the present analysis, 196 children were examined in the HSE North-East and 150 children were examined in the HSE South-East (Table 4.1) at

baseline (i.e. first examination). Out of these, 67 females and 129 males were examined in the HSE North-East and 57 females and 93 males were examined in the HSE South-East. The gender balance was similar in the two populations, which was 65.8 percent male and 34.2 percent female in HSE North-East and 62.0 percent male and 38.0 percent female in the HSE South-East.

Table 4.1: Baseline Number Of Children Examined And Gender Distribution: Total Sample, HSE North-East And HSE South-East

	Total			
N	346			
	Male		**Female**	
N	222		124	
Percent	64.2		35.8	
Region	**HSE North-East**		**HSE South-East**	
N	196		150	
Percent	56.6		43.4	
	Male	**Female**	**Male**	**Female**
N	129	67	93	57
Percent	65.8	34.2	62.0	38.0

A breakdown in the different counties showed that the majority of children reside in Co. Meath (Table 4.2). However, this table is based on the child's registered address and it cannot be concluded from this breakdown that it exactly reflects the use of HSE primary care centres as clients may not always use the primary care centres within the boundary of their respective county of residence.

Table 4.2: Baseline Regional Distribution Of Participants At County Level

	County	**Frequency**	**Percent**
North-East	Co. Cavan	14	3.9
	Co. Louth	30	8.4
	Co. Meath	140	39.1
	Co. Monaghan	12	3.4
South-East	Co. Kilkenny	57	15.9
	Co. Tipperary	41	11.5
	Co. Waterford	21	5.9
	Co. Wexford	31	8.7

4.2.1.2 Water Fluoridation

Approximately 72 percent of the population in the Republic of Ireland has fluoridated domestic water supplies as a result of the Health (Fluoridation of Water Supplies) Act 1960, which introduced water fluoridation in the Republic of Ireland. Information on the water supply was recorded by questionnaire. The child's parents / legal guardians were asked whether the child's home was connected to the piped public water supply. Fluoridation status was classified for each child on based of this information (Table 4.3). A regional breakdown of the reported use of fluoridated water revealed that approximately 10 percent more children in the HSE South-East consumed fluoridated water.

Table 4.3: Baseline Distribution Of Households Connected To Public Water Supply: Total Sample, HSE North-East and HSE South-East

Region	HSE North-East		HSE South-East	
N	196		150	
Percent	56.6		43.4	
	Public water supply	**No public water supply**	**Public water supply**	**No public water supply**
N	143	53	125	25
Percent	73.0	27.0	83.3	16.7

4.2.1.3 Age Distribution

Table 4.4 gives a detailed overview on the age distribution of the sample in the two regions at baseline. In the HSE North-East a significant proportion of the children were in the youngest age group (37.2%) whereas in the HSE South-East approximately two third of the children were five years of age or older.

In order to conduct a chi-square test of homogeneity (i.e. chi-square test for independence), children from the two regions were arranged in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds'). Table 4.4. demonstrates that all relevant cells had an expected count of >5. The minimum expected count was 18.63. The Pearson chi-square test for independence indicated a significant association between the regions (HSE North-East and HSE South-East) and the age groups (the two-tailed *p*-value equals <0.001). This suggests that the distribution of the proportion of children in the three age groups is statistically significantly different in the HSE North-East from the proportion of children in the three age groups in the HSE South-East. This indicates a regional variation in the age distribution of participating children.

Table 4.4: Baseline Age Distribution: HSE North-East (NE) And HSE South-East (SE)

		Age						
		<2 years	3 years	4 years	5 years	6 years	≥7 years	Total
Total	N	85	43	55	61	50	43	337
	%	25.2	12.8	16.3	18.1	14.8	12.8	100.0
North-East	N	71	30	34	30	17	9	191
	%	37.2	15.7	17.8	15.7	8.9	4.7	100.0
South-East	N	14	13	21	31	33	34	146
	%	9.7	8.8	14.4	21.2	22.6	23.3	100.0
		≤3 years		4-6 years		≥7 years		
North-East	N	101		81		9		
	%	52.9		42.4		4.7		
	Expected N	72.5		94.1		24.4		
South-East	N	27		85		34		
	%	18.5		58.2		23.3		
	Expected N	55.5		71.9		18.6		

4.2.1.4 Disability Distribution

All children examined were classified into one of the following five disability groups, based on their reported medical diagnosis: cognitive disability, physical disability, cognitive disability and medically compromised, medically compromised and children whose diagnosis had not yet been established. Table 4.5 demonstrates that the distribution between children with a cognitive disability and children with a physical disability were very similar in the two regions. The majority of children in the two regions were diagnosed with a cognitive disability.

In order to conduct a chi-square test of homogeneity (i.e. chi-square test for independence), children from the two regions were grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. Table 4.5. demonstrates that all relevant cells had an expected count of >5. The minimum expected count was 38.15. The Pearson chi-square test for independence indicates a significant association between the regions (HSE North-East and HSE South-East) and the disability categories (the two-tailed *p*-value equals 0.007). This suggests that the proportion of children with a cognitive disability is statistically significantly different in the HSE North-East from the proportion of children with a cognitive disability in the HSE South-East. This indicates a regional variation in the distribution children with a cognitive disability.

Table 4.5: Baseline Disability Distribution: Total Sample, HSE North-East And HSE South-East

		Disability					
		Cognitive	Physical	Cognitive & Medically	Medically Compromised	Not Diagnosed	Total
Total	N	218	35	40	11	42	346
	%	63.0	10.1	11.6	3.2	12.1	100.0
North-East	N	123	20	34	3	16	196
	%	62.8	10.2	17.3	1.5	8.2	100.0
South-East	N	95	15	6	8	26	150
	%	63.3	10.0	4.0	5.3	17.3	100.0

		Cognitive	Non-Cognitive
North-East	N	157	39
	%	80.1	19.9
	Expected N	146.2	49.8
South-East	N	101	49
	%	67.3	32.7
	Expected N	111.8	38.2

In order to investigate if there was an association between the proportion of children with cognitive disability and their age, a chi-square test of homogeneity was conduct. Children were aggregated in one of the three age groups and again stratified in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. Table 4.6. demonstrates that all relevant cells had an expected count of >5. The minimum expected count was

10.72. The Pearson chi-square test for independence indicates no significant association between the three age groups ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') and the disability categories (the two-tailed *p*-value equals 0.128). This suggests that the proportion of children with a cognitive disability is not statistically significant different in the three age groups. This indicates that the proportion of children with a cognitive disability is evenly distributed between the three age groups.

Table 4.6: Baseline Disability Distribution: Total Sample Stratified By Age Group

			Disability		
			Cognitive	Non-Cognitive	Total
Age Group	≤3 years	N	97	31	128
		%	75.8	24.2	100.0
		Expected N	96.1	31.9	128.0
	4-6 years	N	129	37	166
		%	77.7	22.3	100.0
		Expected N	124.6	41.4	166.0
	≥7 years	N	27	16	43
		%	62.8	37.2	100.0
		Expected N	32.3	10.7	43.0

Furthermore, a breakdown for the two regions (Table 4.7) demonstrated that this distribution pattern was broadly consistent throughout the three age groups in the two regions. The majority of children in the three age groups in the two regions were diagnosed with a cognitive disability.

Table 4.7: Baseline Disability Distribution: HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

				Disability		
				Cognitive	Non-Cognitive	Total
Age Group	≤3 years	NE	N	78	23	101
			%	77.2	22.8	100.0
		SE	N	19	8	27
			%	70.4	29.6	100.0
	4-6 years	NE	N	70	11	81
			%	86.4	13.6	100.0
		SE	N	59	26	85
			%	69.4	30.6	100.0
	≥7 years	NE	N	5	4	9
			%	55.6	44.4	100.0
		SE	N	22	12	34
			%	64.7	35.3	100.0

4.2.1.5 Deprivation Status

The Small Area Health Research Unit (SAHRU) Index was used as a measure of material deprivation in the sample population. The SAHRU Index is very similar to that developed by Townsend (1987) and Carstairs and Morris (1991) in the UK, but has been adapted for the Republic of Ireland (Kelly and Sinclair, 1997, 2007). The SAHRU Index provides a score between 1 to 10 for each electoral division (ED) and the last decile comprises the most deprived EDs in the country. The

application of the SAHRU Index was based on the child's registered home address. The child's registered home address was geocoded by use of the GeoDirectory software (An Post GeoDirectory Limited, Dublin, Ireland). Out of a total of 546 contact details forwarded for inclusion in the study, 506 contact details were identified and geocoded and subsequently the addresses' ED established. The level of deprivation of the family's ED was used as a proxy for the family's level of deprivation i.e. families are defined by a deprivation score and whether they belong to the HSE North-East with HSE South-East. A Wilcoxon Rank Sums test of the shape of the distribution of the deprivation scores across the two regions was performed in order to compare the HSE North-East or HSE South-East. The non-parametric Mann-Whitney U test (Figure 4.3; Table 4.8) showed no statistically significant difference based on deprivation score when comparing the two regions (*p*-value equals 0.098).

Figure 4.3: Boxplot Of SAHRU Deprivation Score Stratified By HSE North-East (0) And HSE South-East (1)

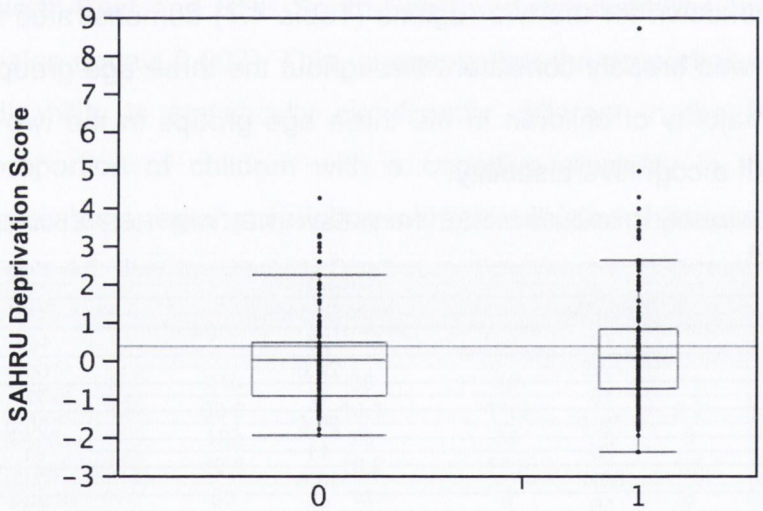


Table 4.8 demonstrates that the median for the HSE North-East was -0.004. This corresponds to the lower end of the 7th decile of the SAHRU-Index. The median for the HSE South-East was +0.06. This corresponds to the middle of the 7th decile.

Table 4.8: Quantiles for the HSE North-East and HSE South-East

	Min.	10%	25%	Median	75%	90%	Max.
North-East	-1.9618	-1.34685	-0.93366	-0.00395	0.459977	1.481703	4.235921
South-East	-2.3982	-1.31629	-0.7505	0.060015	0.807343	2.517801	8.696524

4.2.2 Dental Caries

Children were examined for dental caries, which had extended through the tooth enamel and into dentine, using the dmft index. World Health Organization (WHO)

examination criteria were used in the current study (World Health Organization, 1997). These criteria dictate that only dental caries at cavitation level should be recorded, i.e. it must be possible to confirm a cavitation into dentine by placing a probe in the cavity. An additional reason only to record dental caries at cavitation level was that this level of dental caries was considered to produce non-ambiguous results in the present sample population, which may have a limited ability to co-operate while conducting the examination. A ball tipped CPITN probe was used to remove plaque and to help confirm diagnosis of cavitation.

4.2.2.1 Baseline Results

4.2.2.1.1 Results Stratified by Age

The data are presented as the mean dmft for the sample stratified by age for the two regions (Table 4.9). Clinical examinations with regards to dental caries prevalence were completed in 191 children in the HSE North-East and 146 children in the HSE South-East. Table 4.9 demonstrates that dental caries was detected from 4 years of age, in both regions. As is typical in low caries populations, the dmft values are not normally distributed but are positively skewed with the result that reporting the mean dmft of the two sample populations gives an incomplete picture of the distribution of dental caries in that population. For this reason this study provides additional analyses based on calculation of mean dmft levels in children with positive (dmft>0) score. The analysis of mean dmft levels in children with positive (dmft>0) scores revealed a range of mean dmft value of 4.0 (between mean dmft of 2.0 to 6.0).

Table 4.9: Baseline Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified by Age

Age		N	Mean dmft/DMFT*	Std. Deviation	Range	% Caries Free	Mean dmft in children with dmft>0
≤2	NE	71	0.0	0.0	0	100.0	--
	SE	14	0.0	0.0	0	100.0	--
3	NE	30	0.0	0.0	0	100.0	--
	SE	13	0.0	0.0	0	100.0	--
4	NE	34	0.76	1.724	7	79.4	3.71
	SE	21	0.29	0.784	3	85.7	2.00
5	NE	30	0.67	1.373	5	70.0	2.22
	SE	31	0.58	1.455	6	80.6	3.00
6	NE	17	1.06	2.536	8	60.0	6.00
	SE	33	1.12	1.916	7	63.6	3.08
≥7	NE	9	1.11 / 0.0*	1.83 / 0.0*	5 / 0*	66.7	3.33
	SE	34	0.85 / 0.03*	1.83 / 0.17*	8 / 1*	70.6	2.90

In order to investigate which teeth are actually affected by dental caries, a dmft breakdown of the whole baseline sample was computed, which separated primary

molar teeth from primary incisors and canines. This dmft breakdown demonstrated that the majority of dental caries in pre-school children with disabilities occurred in primary molar teeth (mean dmft 0.4; std. deviation 1.261; range 8) whereas primary incisors and canines remained largely caries free (mean dmft 0.09; std. deviation 0.456; range 4). A further breakdown at surface level (dmfs) showed the distribution of affected surfaces (Figure 4.4).

Figure 4.4: Baseline Distribution Of Decayed, Filled And Missing Surfaces Due To Dental Caries In The Primary Dentition

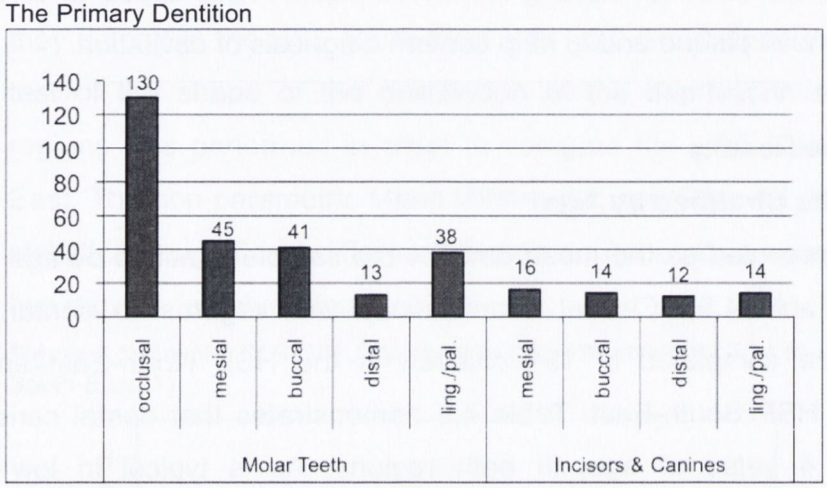


Figure 4.4 demonstrates that the majority of surfaces affected were occlusal surfaces in molar teeth. Interestingly, molar teeth distal surfaces were considerably less affected when compared with mesial, buccal and lingual / palatal surfaces. The mean dmft gives no indication of the range of values that make it up. Therefore it is useful to look at the frequency distribution of the number of decayed, missing and filled primary teeth for the different ages. From Tables 4.9, 4.10 and 4.11 it can be seen that no dental caries was recorded for children three years or younger. Dental caries was first detected in 4-year old children in the two regions.

Table 4.10: Baseline Range Of Dental Caries (dmft) In The HSE North-East Stratified by Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	30	100	30	100	27	79.4	21	70.0	14	82.4	6	66.7
1	--	--	--	--	1	2.9	5	16.7	--	--	--	--
2	--	--	--	--	1	2.9	1	3.3		--	1	11.1
3	--	--	--	--	--	--	1	3.3	1	5.9	1	11.1
4	--	--	--	--	4	11.8	--	--	--	--	--	--
5	--	--	--	--	--	--	2	6.7	--	--	1	11.1
6	--	--	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	1	2.9	--	--	1	5.9	--	--
8	--	--	--	--	--	--	--	--	1	5.9	--	--

Table 4.10 and 4.11 demonstrate that the distribution patterns of dental caries at baseline were broadly similar in both regions.

Table 4.11: Baseline Range Of Dental Caries (dmft) In The HSE South-East Stratified by Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	14	100	13	100	18	85.7	25	80.6	21	63.6	24	70.6
1	--	--	--	--	1	4.8	2	6.5	3	9.1	3	8.8
2	--	--	--	--	1	4.8	1	3.2	3	9.1	4	11.8
3	--	--	--	--	1	4.8	--	--	2	6.1	--	--
4	--	--	--	--	--	--	2	6.5	1	3.0	1	2.9
5	--	--	--	--	--	--	--	--	1	3.0	--	--
6	--	--	--	--	--	--	1	3.2	1	3.0	1	2.9
7	--	--	--	--	--	--	--	--	1	3.0	--	--
8	--	--	--	--	--	--	--	--	--	--	1	2.9

In order to allow a better comparison of the data, children were then arranged in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds'). Table 4.12 shows key dental caries figures at baseline for the three age groups in the HSE North-East and HSE South-East.

Table 4.12: Baseline Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. Of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Age Group

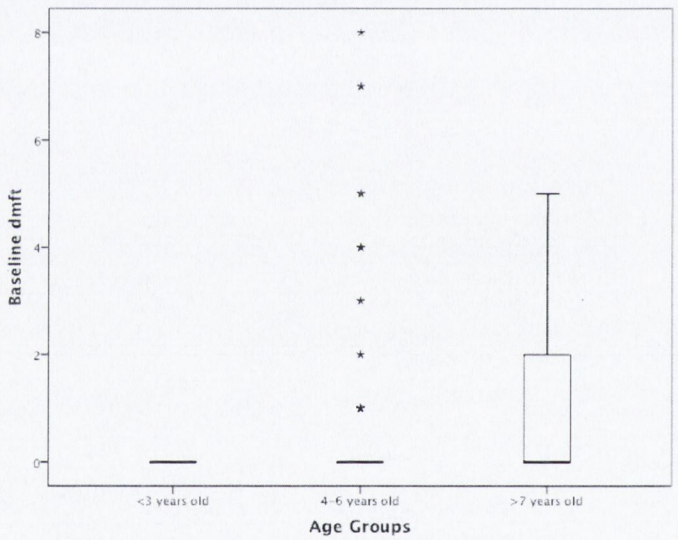
		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
All Children	N	101	81	9	27	85	34
	Mean dmft	0.00	0.23	0.33	0.00	0.25	0.29
	SD	0.000	0.426	0.500	0.000	0.434	0.462
	% Caries-free	100.0	76.5	66.7	100.0	75.3	79.4
	Mean Rank	85.00	107.37	117.11	58.00	76.11	79.28
Children with dmft>0	N	--	19	3	--	21	7
	Mean dmft	--	3.37	3.33	--	2.90	2.90
	SD	--	2.266	1.528	--	1.868	2.378
	Range	--	7	3	--	6	7

An examination of the distribution of the dmft scores revealed that it was not normal distributed. For this reason the present study reports the mean dmft values and standard deviations for the total sample and for a subgroup of children with a positive dmft score (dmft>0), but also provides summary analyses based on a non-parametric rank sum test. Between one-third (33.3%) and one-fifth (20.6%) of the children in the two older age groups ('4-6-year-olds' and '≥7-year-olds') showed a positive dmft score (dmft>0). Calculation of the mean dmft for these children with a positive dmft score (dmft>0) demonstrated that dental caries prevalence in the two

older age groups ('4-6-year-olds' and '≥7-year-olds') were very similar (HSE North-East) or identical (HSE South-East) within each region, but the overall dental caries prevalence in these children were higher in the HSE North-East when compared to the HSE South-East.

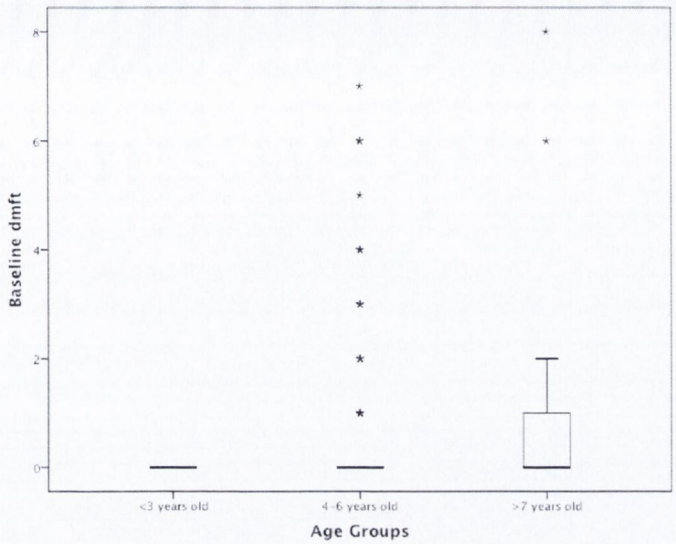
The non-parametric Kruskal-Wallis H test showed a significant difference in dmft levels across the three age groups in the HSE North-East ('≤3-year-olds', *n*=101; '4-6-year-olds', *n*=81; '≥7-year-olds', *n*=9). The association between the dmft mean ranks and the three age groups is considered to be statistically significant [the Chi-square equals 28.442 (2, *n*=191; *p*-value <0.0005)]. The significance is due to dmft distribution differing markedly in the oldest age group ('≥7-year-olds') from the other two age groups ('≤3-year-olds' and '4-6-year-olds') (Figure 4.5).

Figure 4.5: Boxplot Of Baseline dmft Distribution Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE North-East



The non-parametric Kruskal-Wallis H test showed a significant difference in dmft levels across the three age groups in the HSE South-East ('≤3-year-olds', *n*=27; '4-6-year-olds', *n*=85; '≥7-year-olds', *n*=34). The association between the dmft mean ranks and the three age groups is considered to be statistically significant [the Chi-square equals 8.978 (2, *n*=146; *p*-value equals 0.011)]. The significance is due to dmft distribution differing markedly in the oldest age group ('≥7-year-olds') from the other two age groups ('≤3-year-olds' and '4-6-year-olds') (Figure 4.6).

Figure 4.6: Boxplot Of Baseline dmft Distribution Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE South-East



In order to examine the baseline data further, Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) between the HSE North-East (NE) and the South-East (SE) (Table 4.13). The difference in baseline dmft values between the HSE North-East (NE) and the South-East (SE) was not statistically significant across the age groups [the two-tailed *p*-value equals 1.0000 ('≤3-year-olds'), 0.8583 ('4-6-year-olds') and 1.0000 ('≥7-year-olds') respectively].

Table 4.13: Baseline dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

	'≤3-year-olds'		**'4-6-year-olds'**		**'≥7-year-olds'**	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
NE	101	0	62	19	6	3
SE	27	0	64	21	24	10

4.2.2.1.2 Results Stratified by Disability

As the type of disability may influence the occurrence of dental caries in pre-school children with disabilities, it is useful to analyse caries distribution patterns in these children according to their disability as well. All children were classified in five groups: children with a cognitive disability (1), children with a physical disability (2), children with a cognitive disability which are medically compromised as well (3), medically compromised children (4) and children which have not yet been diagnosed (5), but who are registered with Enable Ireland, because they require special care. Table 4.14 demonstrates that the proportion of caries-free children is consistently higher in the HSE North-East when compared to the HSE

South-East. Furthermore, the analysis of mean dmft levels in children with positive (dmft>0) scores revealed broadly similar dental caries levels in children with a cognitive disability in the two regions, which appeared to be marginally higher in the HSE North-East. This indicates that marginally fewer children with a cognitive disability in the HSE North-East were affected by dental caries, but the distribution of counts in dmft scores was similar in the two regions.

Table 4.14: Baseline Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified by Disability

Disability		N	Mean dmft	Std. Deviation	Range	% Caries-free	Mean dmft in children with dmft>0
Cognitive	NE	123	0.50	1.484	8	85.4	3.44
	SE	95	0.72	1.693	8	77.9	3.24
Physical	NE	20	0.0	0.0	0	100.0	--
	SE	15	0.47	1.356	5	86.7	3.50
Cognitive & Med. Comp.	NE	34	0.35	1.125	5	88.2	3.00
	SE	6	1.00	1.673	4	66.7	3.00
Medically Compromised	NE	3	0.0	0.0	0	100.0	--
	SE	8	0.38	0.744	2	75.0	1.50
Not Diagnosed	NE	16	0.0	0.0	0	100.0	--
	SE	26	0.50	1.273	6	76.9	2.17

As the mean dmft does not give an indication of the values of its component parts, it is useful to look at the frequency distribution of the number of decayed, missing and filled primary teeth for each disability group. Tables 4.15 and 4.16 confirm that the majority of children fall into the cognitive disability group and that approximately 85.4 percent of those children in the HSE North-East and 77.9 percent of those children in the HSE South-East were caries-free. Furthermore, Tables 4.15 and 4.16 confirm the assumption that marginally fewer children with a cognitive disability were affected by dental caries in the HSE North-East.

Table 4.15: Baseline Range Of Dental Caries (dmft) In The HSE North-East Stratified By Disability Group

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	105	85.4	20	100	30	88.2	3	100	16	100
1	5	4.1	--	--	1	2.9	--	--	--	--
2	2	1.6	--	--	1	2.9	--	--	--	--
3	3	2.4	--	--	--	--	--	--	--	--
4	3	2.4	--	--	1	2.9	--	--	--	--
5	2	1.6	--	--	1	2.9	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	2	1.6	--	--	--	--	--	--	--	--
8	1	0.8	--	--	--	--	--	--	--	--

Furthermore, no children in the physical, medically compromised and not diagnosed group showed any dental caries in the HSE North-East at any age (Table 4.15).

Table 4.16: Baseline Range Of Dental Caries (dmft) In The HSE South-East Stratified By Disability Group

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	74	77.9	13	86.7	4	66.7	6	75.0	20	76.9
1	6	6.3	--	--	--	--	1	12.5	3	11.5
2	4	4.2	1	6.7	1	16.7	1	12.5	2	7.7
3	3	3.2	--	--	--	--	--	--	--	--
4	3	3.2	--	--	1	16.7	--	--	--	--
5	--	--	1	6.7	--	--	--	--	--	--
6	3	3.2	--	--	--	--	--	--	1	3.8
7	1	1.1	--	--	--	--	--	--	--	--
8	1	1.1	--	--	--	--	--	--	--	--

In order to allow better comparison of the data, children were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability, as dental caries prevalence in children with a cognitive disability appear to markedly differ from children with a non-cognitive disability (Table 4.17).

Table 4.17: Baseline Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD), % of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
All Children	N	157	39	101	49
	Mean dmft	0.47	0.00	0.73	0.47
	SD	1.412	0.000	1.685	1.209
	% Caries-free	86.0	100.0	77.2	79.6
	Mean Rank	101.23	87.50	76.39	73.66
Children with dmft>0	N	22	--	23	10
	Mean dmft	3.36	--	3.22	2.30
	SD	2.150	--	2.131	1.767
	Range	7	--	7	5

Analyses based on these two aggregated disability groups and on calculation of mean dmft levels in children with positive (dmft>0) score made transparent that regional variations in dental caries prevalence exist: pre-school children with a non-cognitive disability appeared not to be affected by dental caries in the HSE North-East, whereas children with a non-cognitive disability in the HSE South-East appeared to show dental caries; fewer children with a cognitive disability in the HSE North-East were affected by dental caries, but the mean dmft in children with

a positive dmft scores (dmft>0) was higher when compared to their peers in the HSE South-East.

Furthermore, grouping into the disability categories 'Cognitive' and 'Non-Cognitive' allowed the application of a non-parametric rank sum test for further analysis. The non-parametric Mann-Whitney U test showed a significant difference between dmft mean ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE North-East. The association between the dmft scores and the two disability groups is considered to be statistically significant (*p*-value equals 0.014). The significance is due to the dmft mean rank in children with a cognitive disability differing markedly from the children with a non-cognitive disability (Table 4.17). The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE South-East (*p*-value equals 0.619).

In order to examine the baseline data further, Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline between the HSE North-East and the South-East (Table 4.18).

Table 4.18: Baseline dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In The HSE North-East And HSE South-East Stratified By Disability Group

	Cognitive Disability		**Non-Cognitive Disability**	
	dmft=0	dmft>0	dmft=0	dmft>0
North-East	135	22	39	0
South-East	78	23	39	10

In children with a cognitive disability the difference in baseline dmft values between the HSE North-East and HSE South-East was not statistically significant (the two-tailed *p*-value equals 0.0922). In children with a non-cognitive disability, the difference in baseline dmft values between the HSE North-East and the South-East was considered to be statistically significant (the two-tailed *p*-value equals 0.0020), which was due to the caries-free status of all pre-school children with a non-cognitive disability in the HSE North-East.

4.2.2.1.3 Results Stratified by Age and Disability

As both the age and type of disability appear to influence the occurrence of dental caries in pre-school children with disabilities, it is useful to analyse the dental caries distribution patterns in these children simultaneously according to age and

disability. In order to allow descriptive analysis and comparison of the data, children were arranged in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds') and grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. Table 4.19 demonstrates that dental caries prevalence (dmft>0) in children with a cognitive disability appear to markedly differ from children with a non-cognitive disability in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups. Children with a cognitive disability appear to suffer more severely from dental caries from four years of age when compared with children with a non-cognitive disability.

Table 4.19: Baseline Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation Stratified by Age Group And Disability Group

			Disability	
			Cognitive	Non-Cognitive
Age Group	≤3 years	N total	98	35
		% Caries Free	100.0	100.0
		N (dmft>0)	0	0
		Maximum	--	--
		Mean dmft>0	--	--
		Std. Deviation	--	--
	4-6 years	N total	131	33
		% Caries Free	73.3	84.6
		N (dmft>0)	35	6
		Maximum	8	5
		Mean dmft>0	3.26	2.17
		Std. Deviation	2.091	1.472
	≥7 years	N total	27	16
		% Caries Free	63.0	81.3
		N (dmft>0)	10	3
		Maximum	8	2
		Mean dmft>0	3.40	1.67
		Std. Deviation	2.319	0.577

In order to examine the baseline findings further, the data were then additionally analysed according to their regional distribution ('HSE North-East' and 'HSE South-East') (Table 4.20). Calculation of the mean dmft for children with a positive dmft score (dmft>0) demonstrated that dental caries levels in children with a cognitive disability were similar in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups in the two regions. The mean dmft for children with a positive dmft score (dmft>0) ranged between 3.13 to 3.43 in these subgroups of children. Furthermore, dental caries prevalence in children with a non-cognitive disability was lower in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups in the HSE North-East when compared with the HSE South-East.

Table 4.20: Baseline Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation In The HSE North-East (NE) And South-East (SE) Stratified by Age Group And Disability Group

				Disability	
				Cognitive	Non-Cognitive
Age Group	≤3 years	NE	N total	78	23
			% Caries Free	100.0	100.0
			N (dmft>0)	0	0
			Maximum	--	--
			Mean dmft>0	--	--
			Std. Deviation	--	--
		SE	N total	19	8
			% Caries Free	100.0	100.0
			N (dmft>0)	0	0
			Maximum	--	--
			Mean dmft>0	--	--
			Std. Deviation	--	--
	4-6 years	NE	N total	70	11
			% Caries Free	72.9	100.0
			N (dmft>0)	19	0
			Maximum	8	--
			Mean dmft>0	3.37	--
			Std. Deviation	2.266	--
		SE	N total	59	26
			% Caries Free	72.9	80.8
			N (dmft>0)	16	5
			Maximum	6	5
			Mean dmft>0	3.13	2.20
			Std. Deviation	1.928	1.643
	≥7 years	NE	N total	5	4
			% Caries Free	40.0	100.0
			N (dmft>0)	3	0
			Maximum	5	--
			Mean dmft>0	3.33	--
			Std. Deviation	1.528	--
		SE	N total	22	12
			% Caries Free	68.2	75.0
			N (dmft>0)	7	3
			Maximum	8	2
			Mean dmft>0	3.43	1.67
			Std. Deviation	2.699	0.577

4.2.2.1.4 Results in 2nd Examination Attendees Stratified by Age

In order to examine the development of dental caries over time, a subgroup of participants was selected, which consisted of children who were examined at baseline and who attended the second examination (see Figure 4.2 for the analysis plan of the quantitative data). This section presents the dental caries levels at baseline in this subgroup (C2) of children stratified by age for the HSE North-East (NE) and HSE South-East (SE). Table 4.21 provides an overview of the mean dmft/DMFT distribution at baseline in these children stratified by age. The mean dmft/DMFT distribution at baseline is evidently similar to the distribution found in all children examined at baseline (Table 4.9).

Table 4.21: Baseline Mean dmft/DMFT*, Standard Deviation, Range, Percentage of Caries-free Children In 2nd Examination Attendees In The HSE North-East (NE) and South-East (SE) Stratified by Age

Age	Region	N	Mean dmft/DMFT*	Std. Deviation	Range	% Caries-free
≤2	NE	36	0.0	0.0	0	100.0
	SE	7	0.0	0.0	0	100.0
3	NE	11	0.0	0.0	0	100.0
	SE	10	0.0	0.0	0	100.0
4	NE	20	0.45	1.234	4	85.0
	SE	15	0.20	0.775	3	93.3
5	NE	16	0.63	1.310	5	68.8
	SE	17	1.00	1.871	6	70.6
6	NE	3	2.33	4.041	7	66.7
	SE	21	0.90	1.729	6	66.7
≥7	NE	4	2.50 / 0.0*	2.08 / 0.0*	5 / 0*	25.0
	SE	19	0.32 / 0.0*	0.67 / 0.0*	2 / 0*	78.9

Appendix A: Table 4.22 and Appendix A: Table 4.23 present the dmft frequency distribution stratified by age for the HSE North-East and HSE South-East region. The findings vindicate the descriptive account that the mean dmft/DMFT distribution in this subgroup of children was broadly similar to the distribution found in all children. For example, from Tables 4.21, Appendix A: 4.22 and Appendix A: 4.23 it can be seen that children three years and younger had no dental caries prevalence in either regions and that the overall distribution patterns were similar to the distribution found in the overall baseline sample.

In addition, the results were aggregated into the following three age groups: '≤3-year-olds', '4-6-year-olds' and '≥7-year-olds'. Table 4.24 shows the mean dmft distribution for these age groups in the HSE North-East and HSE South-East region. This grouping demonstrated that no dental caries at the level of dentine involvement was found in children three years or younger, but different trends in dental caries levels emerged in the two older age groups: dental caries prevalence were similar in 4 – 6-year olds in the two regions, with a marginally higher score in the HSE South-East, but opposite developments in dental caries prevalence were found in the oldest age group ('≥7 year olds') with considerably higher dental caries prevalence in the HSE North-East when compared to the HSE South-East.

Table 4.24: Baseline Key Dental Caries Data In 2nd Examination Attendees Calculated In All Children Examined And Children With dmft>0 (No. Of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East and HSE South-East Stratified By Age Group

		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
All Children	N	49	39	4	17	53	19
	Mean dmft	0.00	0.67	2.50	0.00	0.74	0.32
	SD	0.000	1.595	2.082	0.000	1.583	0.671
	% Caries-free	100.0	76.9	25.0	100.0	75.5	78.9
	Mean Rank	40.50	51.03	75.88	36.50	47.64	45.24
Children with dmft>0	N	--	9	3	--	13	4
	Mean dmft	--	2.89	3.33	--	3.00	1.5
	SD	--	2.205	1.28	--	1.871	0.577
	Range	--	6	3	--	5	1

Furthermore, analyses based on calculation of mean dmft levels in children with positive (dmft>0) score demonstrated broadly similar mean dmft values for the two older age groups ('4-6-year-olds' and '≥7-year-olds') with the exception of the oldest age group ('≥7-year-olds') in the HSE South-East, where the mean dmft value appeared to be considerably lower when compared with the other three age groups. This shift is due to the elimination of positive dmft counts (dmft>0) of children who did not attend the second examination and the low absolute sum in children with a positive dmft count in the oldest age group in the HSE South-East at baseline when compared to all children examined at baseline (Table 4.12). However, these observations are a descriptive account, which has to be seen in context with the subsequent analysis of the whole sample.

The non-parametric Kruskal-Wallis H test showed a significant difference in dmft levels across the three age groups in the HSE North-East ('≤3-year-olds', *n*=49; '4-6-year-olds', *n*=39; '≥7-year-olds', *n*=4). The association between the dmft mean ranks and the three age groups is considered to be statistically significant [the Chi-square equals 24.635 (2, *n*=92; *p*-value <0.0005)]. The significance is due the dmft mean rank differing markedly in the oldest age group ('≥7-year-olds') from the other two age groups ('≤3-year-olds' and '4-6-year-olds') (Appendix A: Figure 4.7).

The non-parametric Kruskal-Wallis H test showed no statistically significant difference in dmft levels across the three age groups in the HSE South-East ('≤3-year-olds', *n*=17; '4-6-year-olds', *n*=53; '≥7-year-olds', *n*=19). The association between the dmft mean ranks and the three age groups is considered not to be statistically significant [the Chi-square equals 5.095 (2, *n*=89; *p*-value equals

0.078)]. The dmft distribution did not differ markedly between the three age groups (Appendix A: Figure 4.8). This indicates that a certain number of children in the oldest age group did not attend the second examination when compared to the Kruskal-Wallis H test result for the total baseline sample (Appendix A: Figure 4.8).

It is interesting to compare the recorded baseline mean dmft values of the three age groups of all children (C1) with the baseline results of children who attended the second examination (C2). This analysis investigates if children who attended the second examination (C2) had similar baseline dmft levels when compared to the entire baseline sample (C1) or if this subgroup (C2) of the baseline sample exhibited at baseline dmft levels, which deviated from the whole sample and therefore do not represent the findings of total baseline sample. Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) between these two subgroups at baseline (Table 4.25).

In the HSE North-East it was found that the difference in baseline dmft values between all children examined (C1) and those children who attended the second examination (C2), was not statistically significant (the two-tailed *p*-value equals 1.0000 in all age groups). These results suggest that the baseline dental caries prevalence in children who attended the second examination (C2) did not differ markedly from the whole sample (C1). In the HSE South-East, the picture was similar. In children aged three years or younger, aged between four to six years and children aged seven years or older the difference in baseline dmft values between all children examined (C1) and those children who attended the second examination (C2) was not statistically significant (the two-tailed *p*-value equals 1.0000 in '≤3-year-olds' and '4-6-year-olds' and the two-tailed *p*-value equals 0.7463 in '≥7-year-olds'). In addition, the result for the children aged seven years or older confirms the finding from the Kruskal-Wallis H test: a difference in dental caries prevalence in this age-group was found, but this difference was not statistically significant.

Furthermore, Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline in those children who attended the second examination (C2) between the HSE North-East (NE) and the South-East (SE) (Table 4.25).

Table 4.25: Baseline Number of Children With 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In All Children (C1) and 2nd Examination Attendees (C2) In The North-East (NE) and South (SE) Stratified By Age Group

	'≤3-year-olds'				'4-6-year-olds'				'≥7-year-olds'			
	C1		C2		C1		C2		C1		C2	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
NE	101	0	49	0	62	19	30	9	6	3	1	3
SE	27	0	17	0	64	21	40	13	24	10	15	4

In children of all age groups ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') was the difference in baseline dmft values not statistically significant (the two-tailed *p*-value equals 1.0000 in all age groups). These results suggest that there was no difference in dental caries prevalence at baseline between children examined in the two regions.

4.2.2.1.5 Results in 2nd Examination Attendees Stratified by Disability

In order to examine the development of dental health patterns over time, a subgroup of participants was selected, which consisted of children who were examined at baseline and who attended the second examination (analogous to section 4.2.2.1.4) stratified by disability. This section presents the dental caries prevalence at baseline in this subgroup of children categorised in five disability groups as described in section 4.2.2.1.2. Table 4.26 provides an overview of the mean dmft/DMFT distribution at baseline in these children stratified by disability.

Table 4.26: Baseline Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children In Attendees Of 2nd Examination In The HSE North-East (NE) And South-East (SE) Stratified By Disability

Disability		N	Mean dmft	Std. Deviation	Range	% Caries-free
Cognitive	NE	66	0.45	1.315	7	84.8
	SE	66	0.53	1.338	6	80.3
Physical	NE	6	0.0	0.0	0	100.0
	SE	10	0.50	1.581	5	90.0
Cognitive & Medically Comp.	NE	18	0.33	1.188	5	88.9
	SE	3	0.67	1.155	2	66.7
Medically Compromised	NE	2	0.0	0.0	0	100.0
	SE	6	0.33	0.816	2	83.3
Not Diagnosed	NE	1	0.0	0.0	0	100.0
	SE	4	0.25	0.500	1	75.0

Appendix A: Table 4.27 and Appendix A: Table 4.28 present the dmft frequency distribution stratified by disability for the HSE North-East and HSE South-East regions.

From Table 4.26, Appendix A: 4.27 and Appendix A: 4.28 it can be seen that the majority of children fall in the 'Cognitive' category in both regions. More than 80 percent of children with a cognitive disability appear to have caries-free dentition.

The data were then aggregated in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability ('cognitive disability' and 'cognitive disability & medically compromised' were merged into one group) and children with a non-cognitive disability ('physical disability', 'medically compromised' and 'not diagnosed' were merged into the other group) in order to allow further statistical analysis. Table 4.29 presents the baseline dmft distribution stratified into the two aggregated disability categories 'Cognitive' and 'Non-Cognitive' for children who attended the second examination in the HSE North-East and HSE South-East region.

Table 4.29: Baseline Key Dental Caries Data In 2nd Examination Attendees Calculated In All Children Examined And Children With dmft>0 (No. Of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
All Children	N	84	9	69	20
	Mean dmft	0.43	0.00	0.54	0.40
	SD	1.283	0.000	1.324	1.188
	% Caries-free	85.7	100.0	79.7	85.0
	Mean Rank	47.64	41.00	45.53	43.18
Children with dmft>0	N	12	--	14	3
	Mean dmft	3.00	--	2.64	2.67
	SD	2.000	--	1.781	2.082
	Range	6	--	5	4

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Descriptive analyses based on these two aggregated disability groups and on calculation of mean dmft levels in children with positive (dmft>0) score confirmed previously found regional variations in dental caries prevalence. For example, pre-school children with a non-cognitive disability appeared not to be affected by dental caries in the HSE North-East, whereas children with a non-cognitive disability in the HSE South-East appeared to show dental caries. Children with positive (dmft>0) and a cognitive disability in the HSE North-East demonstrated to have higher mean dmft when compared to their peers in the HSE South-East. However, the mean dmft scores in children with a cognitive disability and with a non-cognitive disability in the HSE North-East aligned due to the elimination of positive dmft counts (dmft>0) of children who did not attend the second examination However, it is important to remember that these observations are descriptive accounts, which have to be interpreted in context with the subsequent analysis based on the whole sample population.

Grouping into the disability categories 'Cognitive' and 'Non-Cognitive' allowed the application of a non-parametric rank sum test for further analysis. The non-parametric Mann-Whitney U test showed no statistically significant difference between mean dmft ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE North-East (*p*-value equals 0.228) and HSE South-East (*p*-value equals 0.601) regions. However, examination of the *p*-values suggest that there is a distinct difference between these two groups, which is rooted in the caries-free status of children with a non-cognitive disability in the HSE North-East.

It is interesting to compare the caries levels for the two disability groups (i.e. children with a cognitive disability and children with a non-cognitive disability) of all children (C1) with the baseline results of children who attended the second examination (C2) as well. This analysis investigates if children who attended the second examination (C2) had similar baseline dmft levels when compared to the total baseline sample (C1) or if this subgroup of the baseline sample (C2) exhibited already at baseline dmft levels, which deviated from the whole sample and therefore do not represent the findings of total baseline sample. Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) between these two subgroups at baseline (Table 4.30).

In the HSE North-East it was found that the difference in baseline dmft values between all children examined (C1) and those children who attended the second examination (C2) in children with a cognitive disability and in children with a non-cognitive disability was not statistically significant (the two-tailed *p*-value equals 1.0000 for both disability groups). In the HSE South-East the picture was similar. In children with a cognitive disability and in children with a non-cognitive disability the difference in baseline dmft values between all children examined (C1) and those children who attended the second examination (C2) was not statistically significant (the two-tailed *p*-value equals 0.8501 in children with a cognitive disability and the two-tailed *p*-value equals 0.7425 in children with a non-cognitive disability). This suggests that those children who attended the second examination may well be representative of all children examined at baseline.

Table 4.30: Baseline Number Of Children With 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In All Children (C1) And 2nd Examination Attendees (C2) In The North-East And HSE South-East Stratified By Disability Group

	Cognitive Disability				Non-Cognitive Disability			
	C1		C2		C1		C2	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
North-East	135	22	72	12	39	0	9	0
South-East	78	23	55	14	39	10	17	3

Fisher's exact test was then used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline in those children who attended the second examination (C2) between the HSE North-East and the South-East (Table 4.30). In children with a cognitive disability was the difference in baseline dmft values between the HSE North-East and the South-East not statistically significant (the two-tailed *p*-value equals 0.3890). In children with a non-cognitive disability was the difference in baseline dmft values between the HSE North-East and the South-East not considered to be statistically significant (the two-tailed *p*-value equals 0.5320) as well.

4.2.2.2 Second Examination Results

The majority of children who attended the second examination were seen approximately twelve months after the baseline examination for their second examination. However, in some cases, the length of this interval extended beyond 12 months after the baseline examination due to sickness of the child, time constraints by the caregivers etc. In these cases parents / caregivers were offered the next available appointment, which usually deviated not more than six to eight weeks from the initially scheduled appointment and was made at a time that best suited caregivers and child in order to ensure easy attendance. In the HSE North-East 92 children attended their second examination and in the HSE South-East 89 children attended their second examination.

4.2.2.2.1 Results Stratified by Age

The data are presented as the mean dmft for the sample stratified by age for the HSE North-East and HSE South-East. Table 4.31 gives a first impression of the development of dental caries over a one year period in pre-school children with disabilities. Clinical examination with regards to dental caries prevalence were completed and included in this analysis from 89 children (96.7%) in the HSE North-East and 81 children (91.0%) in the HSE South-East. Dental caries data on

three children from the HSE North-East and eight children from the HSE South-East were excluded from the present analysis as preparatory integrity analysis revealed ambiguous / incomplete dental caries data on these children. Table 4.31 provides analyses based on calculation of mean dmft levels in children with positive (dmft>0) score. The analysis of mean dmft levels in children with positive (dmft>0) scores revealed a range of mean dmft value of just under four (3.71, between mean dmft of 1.00 to 4.71).

Table 4.31: 2nd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified By Age

Age	Sample	N	Mean dmft/DMFT*	Std. Deviation	Range	% Caries-free	Mean dmft in children with dmft>0
≤2	NE	22	0.0	0.0	0	100.0	--
	SE	1	0.0	0.0	0	100.0	--
3	NE	10	0.2	0.632	2	90.0	2.00
	SE	5	0.2	0.447	1	80.0	1.00
4	NE	9	0.11	0.333	1	88.9	1.00
	SE	8	0.13	0.354	1	87.5	1.00
5	NE	10	0.10	0.316	1	90.0	1.00
	SE	14	0.43	0.852	3	71.4	1.50
6	NE	16	0.50	0.894	2	75.0	2.00
	SE	16	2.06	3.235	11	56.3	4.71
≥7	NE	22	1.27 / 0.05*	1.93 / 0.21*	7 / 1*	59.9	3.11
	SE	37	0.78 / 0.03*	1.77 / 0.16*	8 / 1*	70.3	2.64

Appendix A: Table 4.32 and Appendix A: Table 4.33 presents the dmft distribution stratified by age for the HSE North-East and HSE South-East region. From Tables 4.31, Appendix A: 4.32 and Appendix A: 4.33 it can be seen that children two years or younger did not show any dental caries in either regions. However, dental caries was detected in 3-year old children in both regions, which demonstrates a progression in dental caries over the observation period. Furthermore, both regions showed broadly similar numbers of children with no dental caries.

In order to allow further analysis and comparison of the data, children were arranged in the following three age groups: '≤3-year-olds', '4-6-year-olds' and '≥7-year-olds' and mean dmft, and the percentage of caries-free children calculated. Furthermore, calculation of mean dmft levels in children with positive (dmft>0) score was carried out as well (Table 4.34). This grouping demonstrated that dental caries appeared in children three years or younger in both regions. Furthermore, opposite trends in dental caries emerged in the two older age groups: in the HSE North-East dental caries was lower in 4 – 6-year olds when compared to children 7-years or older, whereas dental caries prevalence was greater in 4 – 6-year olds when compared to children 7-years or older in the HSE South-East.

Table 4.34: 2nd Examination Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD), % of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Age Group

		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
All Children	N	33	35	21	6	38	37
	Mean dmft	0.06	0.29	1.33	0.17	1.05	0.78
	SD	0.348	0.667	1.958	0.408	2.301	1.766
	% Caries-free	97.0	82.9	57.1	83.3	68.4	70.3
	Mean Rank	38.32	44.14	56.93	34.75	42.12	40.86
Children with dmft>0	N	1	6	9	1	12	11
	Mean dmft	2.00	1.67	3.11	1.00	3.33	2.64
	SD	--	0.516	1.833	--	3.085	2.420
	Range	0	1	6	0	10	7

However, this descriptive analysis of children with positive (dmft>0) has to be seen in context with a reassignment of some of the children in one of the older age groups, noticeable in an increase in the number of children in the oldest age group ('≥7-year-olds') between baseline and second examination and an expansion in the range of dmft scores (Table 4.35). In addition, an increase in detected dental caries occurred, evident in a surge in overall numbers in children with a positive dmft score.

Table 4.35: Baseline and 2nd Examination Number Of Children With A Positive dmft Score (dmft>0), Mean dmft And Range In The HSE North-East And HSE South-East Stratified By Age Group

		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
Baseline	N (dmft>0)	--	9	3	--	13	4
	Mean dmft (dmft>0)	--	2.89	3.33	--	3.00	1.5
	Range	--	6	3	--	5	1
2nd Exam	N (dmft>0)	1	6	9	1	12	11
	Mean dmft (dmft>0)	2.00	1.67	3.11	1.00	3.33	2.64
	Range	0	1	6	0	10	7

Subsequent analysis of the whole sample provided a further insight in the development of dental caries prevalence over the one year period. An examination of the distribution of the dmft score (Tables 4.31, Appendix A: Table 4.32 and Appendix A: Table 4.33) revealed that it was not normally distributed. For this reason, the present study reports in addition to mean dmft values and standard deviations a summary analysis based on non-parametric rank sum tests.

The non-parametric Kruskal-Wallis H test showed a significant difference in dmft levels across the three age groups in the HSE North-East ('≤3-year-olds', *n*=33; '4-

6-year-olds', *n*=35; '≥7-year-olds', *n*=21). The association between the dmft mean ranks and the three age groups is considered to be statistically significant [the Chi-square equals 15.024 (2, *n*=89; the *p*-value equals 0.001)]. The significance is due to the dmft mean rank differing markedly in the oldest age group ('≥7-year-olds') from the other two age groups ('≤3-year-olds' and '4-6-year-olds') (Appendix A: Figure 4.9).

The non-parametric Kruskal-Wallis H test showed no statistically significant difference in dmft levels across the three age groups in the HSE South-East ('≤3-year-olds', *n*=17; '4-6-year-olds', *n*=53; '≥7-year-olds', *n*=19). The association between the dmft mean rank and the three age groups is considered to be not statistically significant [the Chi-square equals 5.095 (2, *n*=89; the *p*-value equals 0.078)]. The dmft distribution did not differing markedly between the three age groups (Appendix A: Figure 4.10).

In order to get a deeper insight in the development of dental caries prevalence in pre-school children with disabilities over time, second examination dmft scores were compared with the baseline results in the same children.

The non-parametric Wilcoxon Signed Rank Test showed no statistically significant difference in dmft levels between baseline and second examination results in children who participated in the dental health intervention programme in the HSE North-East [z = -0.657, p = 0.511, with a small effect size (r = 0.05) using Cohen (1988) criteria]. This indicates that in the intervention group (HSE North-East) no statistically significant increase in dental caries prevalence occurred.

The non-parametric Wilcoxon Signed Rank Test revealed a statistically significant increase in dmft levels between baseline and second examination results in children (i.e. controls, who did not participated in any dental health intervention programme) in the HSE South-East [z = -2.272, p = 0.023, with a small effect size (r = 0.17)]. This indicates that in the same time period in the control group (HSE South-East) a statistically significant increase in dental caries prevalence occurred.

McNemar's test was then used to examine in more detail the changes in dmft levels between baseline and second examination dental caries levels in each age group. Children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline and at the second examination within one region were examined for this analysis (Table 4.36).

Table 4.36: Baseline and 2nd Examination dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) And *p*-values Based On McNemar's Test And Fisher's Exact Test In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Baseline		dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
	NE	49	0	30	9	1	3
	SE	17	0	40	13	15	4
		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Second Examination		dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
	NE	32	1	29	6	12	9
	SE	5	1	26	12	26	11
***p* (McNemar's test)**	NE	0.5000		0.453		1.000	
	SE	0.5000		0.125		0.687	
***p* (Fisher's exact test)**		0.2874		0.1822		0.3923	

McNemar's test revealed that there was no statistically significant difference for any age group between baseline dmft levels and dmft levels recorded at the second examination within a region (Table 4.36). However, analysis of the *p*-values demonstrated that in four to six year olds in the HSE South-East the *p*-value is markedly lower when compared to the other age-groups. This suggests that this group of children who experienced a more pronounced change in dmft counts (dmft>0) over the one year time period.

In addition, Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) at the second examination between the HSE North-East (NE) and the South-East (SE). Fisher's exact test revealed that there was no statistically significant difference for any age group between the HSE North-East and HSE South-East recorded at the second examination (Table 4.36).

In summary, the longitudinal analysis of dental caries prevalence indicates a trend of continued dental caries development in children aged between four to six years in the HSE South-East whereas children who participated in the dental health prevention programme showed no such trend over the one year observation period. However, these different developments in dental caries prevalence between the two regions did not result in a statistically significant difference between the HSE North-East and HSE South-East after one year.

4.2.2.2.2 Results Stratified by Disability

The second examination results are presented as the mean dmft for the sample stratified into five different disability groups (see section 4.2.2.1.2) for the HSE North-East (NE) and HSE South-East (SE) (Table 4.37).

Table 4.37: 2nd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified By Disability

Disability		N	Mean dmft	Std. Deviation	Range	% Caries-free	Mean dmft in children with dmft>0
Cognitive	NE	66	0.58	1.302	7	77.3	2.53
	SE	66	0.91	2.051	11	72.7	3.33
Physical	NE	6	0.0	0.0	0	100.0	--
	SE	10	0.10	0.316	1	90.0	1.00
Cognitive & Med. Comp.	NE	18	0.11	0.471	2	94.4	2.00
	SE	3	2.33	4.041	7	66.7	7.00
Medically Compromised	NE	2	0.0	0.0	0	100.0	--
	SE	6	0.83	0.753	2	33.3	1.25
Not Diagnosed	NE	1	0.0	0.0	0	100.0	--
	SE	4	0.50	0.577	1	50.0	1.00

Appendix A: Table 4.38 and Appendix A: Table 4.39 present the dmft frequency distribution stratified by disability for the HSE North-East and HSE South-East region. It can be seen that the majority of children fall in the cognitive disability group and that far more than 70 percent of all these children were caries-free in either regions. The distribution of dental caries appeared to be very similar to the distribution pattern found in the previous year in the same children. However, mean dmft, range and caries-free status indicate that more children in the HSE South-East were affected by dental caries than in the HSE North-East.

The data were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability in order to allow subsequent statistical analysis. Table 4.40 gives a overview of the dmft distribution and the percentage of caries-free children stratified into the disability categories 'Cognitive' and 'Non-Cognitive' at the second examination in the HSE North-East and HSE South-East regions. Furthermore, calculation of mean dmft levels in children with positive (dmft>0) score was carried out as well (Table 4.40). This grouping demonstrated that pre-school children with a non-cognitive disability appeared to have a lower experience of dental caries in both regions. Children with positive (dmft>0) and a cognitive disability in the HSE South-East had a higher mean dmft when compared to their peers in the HSE North-East.

Table 4.40: 2nd Examination Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
All Children	N	84	9	69	20
	Mean dmft	0.48	0.00	0.97	0.40
	SD	1.187	0.000	2.142	0.598
	% Caries-free	81.0	100.0	72.5	65.0
	Mean Rank	47.86	39.00	44.86	45.50
Children with dmft>0	N	15	--	18	8
	Mean dmft	2.50	--	3.53	1.14
	SD	1.549	--	2.796	0.378
	Range	6	--	10	7

However, this descriptive analysis of children with positive (dmft>0) and the apparent change in mean dmft levels when compared with the baseline findings has to be seen in context of an increase in detected dental caries, evident in the surge in overall numbers in children with a positive dmft score (Table 4.41).

Table 4.41: Baseline and 2nd Examination Number Of Children With A Positive dmft Score (dmft>0), Mean dmft And Range In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
Baseline	N (dmft>0)	12	--	14	3
	Mean dmft (dmft>0)	3.00	--	2.64	2.67
	Range	6	--	5	4
2nd Exam	N (dmft>0)	15	--	18	8
	Mean dmft (dmft>0)	2.50	--	3.53	1.14
	Range	6	--	10	1

In addition, grouping into the disability categories 'Cognitive' and 'Non-Cognitive' allows for the application of a non-parametric rank sum test for further analysis.

The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE North-East (the *p*-value equals 0.154) and HSE South-East (the *p*-value equals 0.902) regions. However, the considerably lower *p*-value between children in the HSE North-East was due to the caries-free status of children with a non-cognitive disability in the HSE North-East.

In order to get a better insight in changes of dental caries prevalence in pre-school children with disabilities over time, it is worth comparing the second examination mean dmft values for each age group with the baseline results for the same children (Table 4.42). McNemar's test was used to examine the association

between children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline and at the second examination within one region.

Table 4.42: Baseline And 2nd Examination Breakdown Of Number Of Children In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In The HSE North-East And HSE South-East Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		dmft=0	dmft>0	dmft=0	dmft>0
North-East	Baseline	72	12	9	0
	2nd Exam	68	16	9	0
	p	0.334		--	
South-East	Baseline	55	14	17	3
	2nd Exam	50	19	13	7
	p	0.227		0.125	

McNemar's test revealed that there was no statistically significant difference for any of the two regions between baseline dmft levels and dmft levels recorded at the second examination (Table 4.42).

In addition, Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) between the baseline and second examination for the HSE North-East (NE) and the South-East (SE). Fisher's exact test revealed that there was no statistically significant difference for children with a cognitive disability (two-tailed *p*-value equals 0.2482) and children with a non-cognitive disability (the two-tailed *p*-value equals 0.0661) between the HSE North-East and HSE South-East at the second examination (Table 4.42).

4.2.2.2.3 Results Stratified by Age and Disability

This section investigated dental caries distribution patterns in pre-school children with disabilities simultaneously according to age and disability, because age and type of disability appear to influence the occurrence of dental caries in these children. In order to allow descriptive analysis and comparison of the data, children were arranged in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds') and grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. Table 4.43 demonstrates that dental caries prevalence in children with a cognitive disability appears to markedly differ from children with a non-cognitive disability, this is particularly true in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups. Children with a cognitive disability appear to be more severely affected (dmft>0) when they

develop dental caries when compared with children with a non-cognitive disability. However, the percentage of caries-free children was lower in children with a non-cognitive disability.

Table 4.43: 2nd Examination Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation Stratified by Age Group And Disability Group

			Disability	
			Cognitive	Non-Cognitive
Age Group	≤3 years	N total	34	7
		% Caries Free	97.1	85.7
		N (dmft>0)	1	1
		Maximum	2	1
		Mean dmft>0	2.00	1.00
		Std. Deviation	--	--
	4-6 years	N total	61	12
		% Caries Free	73.8	83.3
		N (dmft>0)	16	2
		Maximum	11	1
		Mean dmft>0	3.00	1.00
		Std. Deviation	2.708	0.00
	≥7 years	N total	47	11
		% Caries Free	66.0	63.6
		N (dmft>0)	16	4
		Maximum	8	2
		Mean dmft>0	3.25	1.25
		Std. Deviation	2.206	0.500

In order to examine these findings further, the data were then additionally analysed according to their regional distribution ('HSE North-East' and 'HSE South-East') (Table 4.44). Calculation of the mean dmft for children with a positive dmft score (dmft>0) demonstrated that dental caries levels in children with a cognitive disability were lower in the medium ('4-6-year-olds') age group in the HSE North-East and similar in the oldest ('≥7-year-olds') age group in the two regions. Furthermore, dental caries prevalence levels in children with a non-cognitive disability demonstrated that examined all children in the HSE North-East were caries-free whereas some dental was found in the HSE South-East.

Table 4.44: 2nd Examination Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation In The HSE North-East (NE) And South-East (SE) Stratified by Age Group And Disability Group

				Disability	
				Cognitive	Non-Cognitive
Age Group	≤3 years	NE	N total	30	3
			% Caries Free	96.7	100.0
			N (dmft>0)	1	0
			Maximum	2	--
			Mean dmft>0	2.00	--
			Std. Deviation	--	--
		SE	N total	4	2
			% Caries Free	100.0	50.0
			N (dmft>0)	0	1
			Maximum	--	1
			Mean dmft>0	--	1.00
			Std. Deviation	--	--
	4-6 years	NE	N total	32	3
			% Caries Free	81.3	100.0
			N (dmft>0)	6	0
			Maximum	2	--
			Mean dmft>0	1.67	--
			Std. Deviation	0.516	--
		SE	N total	29	9
			% Caries Free	65.5	77.8
			N (dmft>0)	10	2
			Maximum	11	1
			Mean dmft>0	3.80	1.00
			Std. Deviation	3.190	0.000
	≥7 years	NE	N total	19	2
			% Caries Free	52.6	100.0
			N (dmft>0)	9	0
			Maximum	7	--
			Mean dmft>0	3.11	--
			Std. Deviation	1.833	--
		SE	N total	28	9
			% Caries Free	75.0	55.6
			N (dmft>0)	7	4
			Maximum	8	2
			Mean dmft>0	3.43	1.25
			Std. Deviation	2.760	0.500

4.2.2.2.4 Results in 3rd Examination Attendees Stratified by Age

In order to examine the development of dental health patterns over time further, a subgroup of participants was selected in accordance with the analysis plan for the quantitative data (Figure 4.2). Children who were not only examined at the second examination, but also attended the third examination were identified and assigned in this subgroup. This section presents the dental caries prevalence at the second examination in this subgroup of children stratified by age for the HSE North-East (NE) and HSE South-East (SE) (Table 4.45). This selection allowed investigation of differences in second examination results between all children who attended second examination and this subgroup of children who attended the third examination existed. Table 4.45 demonstrates that in the HSE North-East only 15

datasets (clinical examination results and questionnaire) were entered on the database on the cut-off date (31.12.2009). For that reason, any further longitudinal analysis HSE North-East data will be limited in its explanatory power. Three datasets collected in the HSE South-East were excluded from the present analysis as they demonstrated ambiguous third examination dates, which are the bases for the identification of the children for this analysis.

Table 4.45: 2nd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children In 3rd Examination Attendees In The HSE North-East (NE) And South-East (SE) Stratified By Age

Age	Sample	N	Mean dmft/DMFT*	Std. Deviation	Range	% Caries-free
≤3	NE	7	0.0	0.0	0	100.0
	SE	4	0.25	0.500	1	75.0
4	NE	4	0.25	0.500	1	75.0
	SE	5	0.20	0.447	1	80.0
5	NE	0	--	--	--	--
	SE	10	0.20	0.422	1	80.0
6	NE	1	0.0	0.0	0	100.0
	SE	9	2.67	3.873	11	44.4
≥7	NE	3	0.0 / 0.0*	0.0 / 0.0*	0 / 0*	100.0
	SE	15	0.67 / 0.0*	1.68 / 0.0*	6 / 0*	80.0

Appendix A: Table 4.46 and Appendix A: Table 4.47 present the dmft frequency distribution stratified by age in the HSE North-East and HSE South-East region. The frequency distribution stratified by age highlights the current limitations of this subset of data. For example, in the HSE North-East only data on one child with a positive dmft score was recorded on the database, which is in contrast to the findings in all children examined at the second examination (Table 4.33). This indicates some limited informative value of this subset of data collected in the HSE North-East. Furthermore, descriptive comparison of caries-free status at the second examination in the HSE South-East between all children examined and children who attended the third examination did not reveal a clear attendance pattern at the third examination based on disease incidence. The proportion of children with caries-free status (dmft=0) went down in 3-, 4- and 6-year olds, whereas the proportion of children with caries-free status increased in 5- and ≥7-year olds. This indicates that parental knowledge of diagnosed disease alone did not translate into greater participation in the oral examination, which was not otherwise routinely available to pre-school children with disabilities in the HSE South-East.

In addition, the results were aggregated into the following three age groups: '≤3-year-olds', '4-6-year-olds' and '≥7-year-olds'. Table 4.48 shows the mean dmft

distribution for these age groups in the HSE North-East and HSE South-East region. This grouping demonstrated the occurrence of similar trends in dental caries in the HSE South-East when compared with the findings for the total sample (Table 4.34). However, no such trend was found in the HSE North-East due to low participation in the third examination before the cut-off data for the present analysis (31.12.2009).

Table 4.48: 2nd Examination Key Dental Caries Data In 3rd Examination Attendees Calculated In All Children Examined and Children with dmft>0 (Number of Children (N), mean dmft, Standard Deviation (SD), % of Caries-free Children and Mean Rank) In The HSE North-East and HSE South-East Stratified By Age Group

		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
All Children	N	7	5	3	4	24	15
	Mean dmft	0.00	0.20	0.00	0.25	1.13	0.47
	SD	0.000	0.447	0.000	0.500	2.610	1.676
	% Caries-free	100.0	80.0	100.0	75.0	66.7	80.0
	Mean Rank	--	--	--	20.63	23.19	20.47
Children with dmft>0	N	--	1	--	1	8	3
	Mean dmft	--	1.00	--	1.00	3.38	3.33
	SD	--	--	--	--	3.701	2.517
	Range	--	0	--	0	10	5

Furthermore, calculation of mean dmft levels in children with positive (dmft>0) score and its comparison with the findings for the total sample examined at the second examination (Table 4.34) revealed a similar trend as found in all children who attended the third examination in the HSE South-East as seen in the table above (Table 4.48): low a mean dmft value in the youngest age group ('≤3-year-olds'), a peak in mean dmft value in 4 - 6-year olds and a marginally lower mean dmft value in the oldest age group ('≥7-year-olds').

In the HSE North-East, no further statistical analysis was undertaken to evaluate differences in dmft levels due to the low participation levels at the third examination.

An examination of the distribution of the dmft score in the HSE South-East revealed that its distribution was not normal distributed. For this reason further summary analysis is based on a non-parametric rank sum test. The non-parametric Kruskal-Wallis H test showed no statistically significant difference in dmft levels across the three age groups in the HSE South-East ('≤3-year-olds', *n*=4; '4-6-year-olds', *n*=24; '≥7-year-olds', *n*=15). The association between the dmft mean ranks and the three age groups is considered to be not statistically

significant [the Chi-square equals 0.0781 (2, n=43; the p-value equals 0.677)]. The dmft distribution did not differing markedly between the three age groups (Appendix A: Figure 4.11).

It is interesting to compare the 2nd examination mean dmft values for the three age groups in all children (C3) with the 2nd examination results of children who attended the second examination (C4). This examination investigated if children who attended the third examination had similar second examination dmft levels when compared with the entire second examination sample or if they exhibited dmft levels, which deviated from the whole sample and therefore do not represent the second examination sample. Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) between these two subgroups at the second examination (Table 4.49). However, this analysis was only undertaken in children from HSE South-East region as the participation level in the HSE North-East was too low for any further statistical evaluation.

In the HSE South-East it was found that in children aged three years or younger ('≤3-year-olds'), aged between four to six years ('4-6-year-olds') and in children aged seven years or older ('≥7-year-olds'), the difference in second examination dmft values between all children examined (C3) and those children who attended the third examination (C4) were not statistically significant (the two-tailed p-value equals 1.0000) in children aged three years or younger and children aged between four to six years; (the two-tailed p-value equals 0.7312 in children aged seven years or older). These results suggest that dental caries prevalence in children who attended the third examination did not differ markedly from the whole sample.

Table 4.49: 2nd Examination Number Of Children With 'No dmft Score' (dmft=0) and 'Combined dmft Scores' (dmft>0) In All Children Examined At 2nd Examination (C3) and 3rd Examination Attendees (C4) In The HSE South-East (SE) Stratified By Age Group

	'≤3-year-olds'				**'4-6-year-olds'**				**'≥7-year-olds'**			
	C3		C4		C3		C4		C3		C4	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
SE	5	1	3	1	26	12	16	8	26	11	12	3

4.2.2.2.5 Results in 3rd Examination Attendees Stratified by Disability

In order to examine the development of dental health patterns over time further, a subgroup of participants was selected in accordance with analysis plan for the quantitative data (Figure 4.2). Children who were not only examined at second examination, but also attended the third examination were identified and assigned to this subgroup. This section presents the dental caries levels at the second

examination in this subgroup of children stratified by disability for the HSE North-East (NE) and HSE South-East (SE) (Table 4.50). This selection allowed investigating if differences in second examination results between all children who attended second examination and this subgroup of children who attended the third examination existed. Table 4.50 demonstrates that in the HSE North-East only 15 datasets (clinical examination results and questionnaire) were entered on the database on the cut-off date (31.12.2009). Analogue to section 4.2.2.2.4, any further longitudinal analysis of HSE North-East data will be limited in its explanatory power.

Table 4.50: 2nd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children In 3rd Examination Attendees In The HSE North-East (NE) And South-East (SE) Stratified by Disability

Disability		N	Mean dmft	Std. Deviation	Range	% Caries-free
Cognitive	NE	10	0.10	0.316	1	90.0
	SE	35	0.83	2.162	11	74.3
Physical	NE	1	0.0	0.0	0	100.0
	SE	7	0.0	0.0	0	100.0
Cognitive & Med. Comp.	NE	4	0.0	0.0	0	100.0
	SE	2	3.5	4.950	7	50.0
Medically Compromised	NE	0	--	--	--	--
	SE	2	1.0	0.0	0	0.0
Not Diagnosed	NE	0	--	--	--	--
	SE	0	--	--	--	--

Appendix A: Table 4.51 and Appendix A: Table 4.52 present the dmft frequency distribution stratified by disability in the HSE North-East and HSE South-East region. The frequency distribution stratified by disability highlights the current limitations of this subset of data. For example, from Tables 4.50, and Appendix A: 4.51 it can be seen that in the HSE North-East only data on one child with a non-cognitive disability was entered on the database before the cut-off data for the present analysis (31.12.2009) and therefore qualified to be included in the present analysis. Descriptive analysis of the HSE South-East data (Appendix A: Table 4.52) demonstrated similar dental caries distribution patterns in children with a cognitive disability in this subgroup of children when compared to all children examined at the second examination.

In addition, the results were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. Table 4.53 shows the mean dmft distribution for these two disability groups in the HSE North-East and HSE South-East region. This grouping demonstrated the occurrence of similar trends in dental caries in the HSE South-East when compared with the findings for the total sample (Table 4.40). However, no such

trend was found in the HSE North-East due to low participation in the third examination before the cut-off data for the present analysis (31.12.2009).

Table 4.53: 2nd Examination Key Dental Caries Data In 3rd Examination Attendees Calculated In All Children Examined And Children With dmft>0 (No. Of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
All Children	N	14	1	37	9
	Mean dmft	0.07	0.00	0.97	0.22
	SD	0.267	0.000	2.339	0.441
	% Caries-free	92.9	100.0	73.0	77.8
	Mean Rank	8.04	7.50	23.88	21.94
Children with dmft>0	N	1	--	10	2
	Mean dmft	1.00	--	3.60	1.00
	SD	--	--	3.373	0.00
	Range	0	--	10	0

Furthermore, calculation of mean dmft levels in children with positive (dmft>0) score and their comparison with the findings for the total sample examined at the second examination (Table 4.40) revealed a similar trend as found in all children who attended the third examination in the HSE South-East in the table above (Table 4.53): a considerably higher mean dmft value in children with a cognitive disability when compared with their peers with a non-cognitive disability.

In the HSE North-East, no further statistical analysis was undertaken to evaluate differences in dmft levels due to the low participation levels at the third examination.

The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE South-East (the *p*-value equals 0.615). This indicates that there is no statistically significant difference in dmft levels between children with a cognitive disability when compared with children with a non-cognitive disability

Fisher's exact test was used to examine the association between children with no caries (dmft=0) and children with some caries experience (dmft>0) at the second examination in the HSE South-East between all children who attended the second examination (C3) and those children of this group who attended the third examination (C4) as well (Table 4.54). In the HSE South-East it was found that the difference in dmft values between these two subgroups is not statistically significant (the two-tailed *p*-value equals 1.0000 for children with a cognitive disability and 0.6749 for children with a non-cognitive disability). This result suggests that the dental caries prevalence in children who attended the third

examination did not differ markedly from the whole sample at the second examination.

Table 4.54: 2nd Examination Number Of Children With 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In All Children (C3) And 3rd Examination Attendees (C4) In The HSE South-East Stratified By Disability Group

	Cognitive Disability				Non-Cognitive Disability			
	C3		C4		C3		C4	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
South-East	50	19	27	10	13	7	7	2

4.2.2.3 Third Examination Results

Approximately twelve months after the second examination, children whose parents / caregivers agreed to continue to participate in the study received their third examination. However, in some cases, the length of this interval extended beyond 12 months after the 2nd examination due to sickness of the child, time constraints by the caregivers etc. In these cases parents / caregivers were offered the next available appointment, which usually deviated no more than six to eight weeks from the initially scheduled appointment and was made at a time that best suited caregivers and child in order to ensure attendance. In the HSE North-East, 15 datasets (examination results and questionnaire) on children who attended their third examination were entered on the database before the cut-off date (31.12.2009) for the present analysis and in the HSE South-East, 46 datasets were entered.

4.2.2.3.1 Results Stratified by Age

The data are presented as the mean dmft for the sample stratified into different age groups for the two regions (Table 4.55). This table gives a first impression of the development of dental caries prevalence after a two year observation period in pre-school children with disabilities. Clinical examinations with regards to dental caries prevalence were completed in 14 children in the HSE North-East and 44 children in the HSE South-East. One dataset collected in the HSE North-East and two datasets collected in the HSE South-East were removed from the present analysis as they demonstrated ambiguous third examination dates, which are the bases for this analysis.

Table 4.55: 3rd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified By Age

Age	Sample	N	Mean dmft/DMFT*	Std. Deviation	Range	% Caries-free	Mean dmft in children with dmft>0
≤3	NE	6	0.0	0.0	0	100.0	--
	SE	2	0.0	0.0	0	100.0	--
4	NE	2	0.0	0.0	0	100.0	--
	SE	3	0.0	0.0	0	100.0	--
5	NE	3	0.33	0.577	1	66.7	1.00
	SE	7	0.0	0.0	0	100.0	--
6	NE	1	0.0	0.0	0	100.0	--
	SE	13	1.54	2.470	7	61.5	4.00
≥7	NE	2	0.0 / 0.0*	0.0 / 0.0*	0 / 0*	100.0	--
	SE	19	0.42 / 0.21*	1.02 / 0.54*	4 / 2	78.9	1.50

Appendix A: Table 4.56 and Appendix A: Table 4.57 present the dmft frequency distribution stratified by age for the HSE North-East and HSE South-East region. The frequency distribution stratified by age highlights the current limitations of the third examination of data. For example, in the HSE North-East only data on one child with a positive dmft score found at the third examination was entered on the database before the cut-off data for the present analysis (31.12.2009). This indicates some limited informative value of this subset of data collected in the HSE North-East. Furthermore, descriptive comparison of these third examination results with second examination results (Appendix A: Table 4.47) demonstrated an increase in dmft scores in the older ages (6-year olds and ≥7-year olds) in the HSE South-East.

In addition, the results were aggregated into the following three age groups: '≤3-year-olds', '4-6-year-olds' and '≥7-year-olds'. Table 4.58 shows the mean dmft distribution for these age groups in all children examined and in children with a positive dmft score (dmft>0). This grouping demonstrated similar trends in dental caries level in the HSE South-East between all children examine and children with a positive dmft score (dmft>0): mean dmft values were approximately twice as high in 4 – 6-year old. When compared to the oldest age group.

Data collected in the HSE North-East was excluded from this descriptive analysis due to low participation in the third examination before the cut-off data for the present analysis (31.12.2009).

Table 4.58: 3rd Examination Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD), % Of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Age Group

		HSE North-East			HSE South-East		
		'≤3 year olds'	'4-6 year olds'	'≥7 year olds'	'≤3 year olds'	'4-6 year olds'	'≥7 year olds'
All Children	N	6	6	2	2	23	19
	Mean dmft	0.00	0.17	0.00	0.00	0.87	0.42
	SD	0.000	0.408	0.000	0.000	1.984	1.017
	% Caries-free	100.0	83.3	100.0	100.0	78.3	78.9
	Mean Rank	--	--	--	18.00	23.00	22.37
Children with dmft>0	N	--	1	--	--	5	4
	Mean dmft	--	1.00	--	--	4.00	2.00
	SD	--	--	--	--	2.449	1.414
	Range	--	0	--	--	6	3

An examination of the distribution of the dmft scores in the HSE South-East revealed that the distribution was not normally distributed. For this reason summary analyses based on a non-parametric rank sum test produced for this region. The non-parametric Kruskal-Wallis H test showed no statistically significant difference in dmft levels across the three age groups in the HSE South-East ('≤3-year-olds', *n*=2; '4-6-year-olds', *n*=23; '≥7-year-olds', *n*=19). The association between the dmft scores i.e. their mean ranks and the three age groups is considered to be not statistically significant [the Chi-square equals 0.569 (2, *n*=44; the *p*-value equals 0.753)]. The mean ranks did not differ markedly between the three age groups (Appendix A: Figure 4.12).

In order to get a deeper insight in the development of dental caries levels in pre-school children with disabilities over time, third examination dmft scores were compared with the second examination results in the same children. However, this comparison was only performed for the HSE South-East sample as the participation level in the HSE North-East were too low to allow any further examination.

The non-parametric Wilcoxon Signed Rank Test revealed a statistically significant increase in dmft levels between second and third examination results in children (i.e. children, who did not participate in any dental health intervention programme) in the HSE South-East [z = -2.272, p = 0.023, with a small effect size (r = 0.17)].

McNemar's test was used to examine in more detail the changes in dmft levels between second and third examination in each age group. Children with no caries (dmft=0) and children with some caries experience (dmft>0) at the second and

third examination in the HSE South-East were examined for this analysis (Table 4.59).

Table 4.59: The 2nd And 3rd Examination dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) For Each Age Group And *p*-values Based On McNemar's Test For The HSE South-East (SE)

	'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
	dmft=0	dmft>0	dmft=0	dmft>0	dmft=0	dmft>0
Second Examination	5	1	26	12	26	11
Third Examination	2	0	18	5	15	4
***p* (McNemar's test)**	1.000		0.500		1.000	

McNemar's test revealed that there was no statistically significant difference for any age group between second examination dmft levels and dmft levels recorded at the third examination (Table 4.59). However, analysis of the *p*-values demonstrated that in four to six year olds in the HSE South-East the *p*-value is markedly lower than between the other age-groups, which aids to identify the group of children who experienced a change in dmft counts (dmft>0) over the one year time period.

4.2.2.3.2 Results Stratified by Disability

The second examination results are presented as the mean dmft for the sample stratified into five different disability groups (see section 4.2.2.1.2) for the HSE North-East (NE) and HSE South-East (SE). Table 4.60 demonstrates that in the HSE North-East only 15 datasets (clinical examination results and questionnaire) were entered on the database on the cut-off date (31.12.2009). Analogue to section 4.2.2.2.4, any further longitudinal analysis of HSE North-East data will be limited in its explanatory power.

Table 4.60: 3rd Examination Mean dmft/DMFT*, Standard Deviation, Range, Percentage Of Caries-free Children And Mean dmft In Children With dmft>0 In The HSE North-East (NE) And South-East (SE) Stratified By Disability

Disability		N	Mean dmft	Std. Deviation	Range	% Caries-free	Mean dmft in children with dmft>0
Cognitive	NE	10	0.1	0.316	1	90.0	1.00
	SE	35	0.6	1.376	6	77.1	2.63
Physical	NE	1	0.0	0.0	0	100.0	--
	SE	7	0.0	0.0	0	100.0	--
Cognitive & Med. Comp.	NE	4	0.0	0.0	0	100.0	--
	SE	2	3.5	4.950	7	50.0	7.00
Medically Compromised	NE	0	--	--	--	--	--
	SE	2	0.0	0.0	0	100.0	--
Not Diagnosed	NE	0	--	--	--	--	--
	SE	0	--	--	--	--	--

Appendix A: Table 4.61 and Appendix A: Table 4.62 present the dmft frequency distribution stratified by disability in the HSE North-East and HSE South-East region. The frequency distribution stratified by disability highlights the current limitations of the third examination data. For example, from Tables 4.60, and Appendix A Table: 4.61 it can be seen that in the HSE North-East only data on one child with a non-cognitive disability was entered on the database before the cut-off data for the present analysis (31.12.2009). This indicates some limited informative value of this subset of data collected in the HSE North-East.

However, descriptive comparison of these third examination results with second examination results (Appendix A: Table 4.52) demonstrated no relevant change in dmft scores in pre-school children with disabilities in the HSE South-East.

The data were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability in order to allow subsequent statistical analysis. Table 4.63 demonstrates that positive dmft scores (dmft>0) were only found in children with a cognitive disability.

Table 4.63: 3rd Examination Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD), % of Caries-free Children And Mean Rank) In The HSE North-East And HSE South-East Stratified By Disability Group

		HSE North-East		HSE South-East	
		Cognitive	Non-Cognitive	Cognitive	Non-Cognitive
All Children	N	14	1	37	9
	Mean dmft	0.07	0.00	0.76	0.00
	SD	0.267	--	1.706	0.000
	% Caries-free	92.9	100.0	75.7	100.0
	Mean Rank	--	..	24.59	19.00
Children with dmft>0	N	1	--	9	--
	Mean dmft	1.00	--	3.11	--
	SD	--	--	2.205	--
	Range	0	--	6	--

No further statistical analysis was undertaken to evaluate differences in dmft levels in the HSE North-East due to the low participation levels.

The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children with a cognitive disability and children with a non-cognitive disability in the HSE South-East (the *p*-value equals 0.105). This indicates that there is no statistically significant difference in dmft levels between children with a cognitive disability when compared with children with a non-cognitive disability

In order to get a better insight in changes of dental caries prevalence in pre-school children with disabilities over time, it is useful to compare the third examination

mean dmft values with second examination results for the same children (Table 4.64). McNemar's test was used to examine in more detail the changes in dmft levels between second and third examination in the two disability groups.

Table 4.64: 2nd and 3rd Examination dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) And p-values Based On McNemar's Test In The HSE South-East Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		dmft=0	dmft>0	dmft=0	dmft>0
South-East	2nd Exam	27	10	7	2
	3rd Exam	28	9	9	0
	p	1.000		0.0500	

McNemar's Test revealed that there was no statistically significant difference between second and third examination dmft levels in children with a cognitive disability. Furthermore, McNemar's Test revealed a statistically significant difference between second and third examination dmft levels in children with a non-cognitive disability. However, the number of children with a non-cognitive disability is low and the clinical relevance of this finding has to be interpreted with caution (Table 4.64).

4.2.2.3.3 Results Stratified by Age and Disability

Because age and type of disability appear to influence the occurrence of dental caries in pre-school children with disabilities, it is useful to analyse the dental caries distribution patterns in these children simultaneously according to age and disability. In order to allow descriptive analysis and comparison of the data, children were arranged in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds') and grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability. However, as mentioned earlier, only very few children in the HSE North-East participated in the third examination. Table 4.65 demonstrates that dental caries prevalence in children with a cognitive disability appear to markedly differ from children with a non-cognitive disability in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups (all examined children with a non-cognitive disability were caries-free).

Table 4.65: 3rd Examination Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation Stratified by Age Group And Disability Group

			Disability	
			Cognitive	Non-Cognitive
Age Group	≤3 years	N total	7	1
		% Caries Free	100.0	100.0
		N (dmft>0)	0	0
		Maximum	--	--
		Mean dmft>0	--	--
		Std. Deviation	--	--
	4-6 years	N total	24	5
		% Caries Free	75.0	100.0
		N (dmft>0)	6	0
		Maximum	7	--
		Mean dmft>0	3.50	--
		Std. Deviation	2.510	--
	≥7 years	N total	18	3
		% Caries Free	77.8	100.0
		N (dmft>0)	4	0
		Maximum	4	--
		Mean dmft>0	2.00	--
		Std. Deviation	1.414	--

In order to examine the baseline findings further, the data were then analysed according to their regional origin ('HSE North-East' and 'HSE South-East') (Table 4.66). However, as mentioned earlier, only very few children in the HSE North-East participated in the third examination. Calculation of the mean dmft for children with a positive dmft score (dmft>0) demonstrated that dental caries levels in children with a cognitive disability were similar in the medium ('4-6-year-olds') and oldest ('≥7-year-olds') age groups in the the HSE South-East. In approximately

one-quarter of all examined children in these two age groups in the the HSE South-East dental caries was found.

Table 4.66: 3rd Examination Number Of Children (Total), Percentage Of Caries-free Children, Number Of Children With dmft>0, Maximum dmft Count, Mean dmft In Children With dmft>0, Standard Deviation In The HSE North-East (NE) And South-East (SE) Stratified by Age Group And Disability Group

				Disability	
				Cognitive	Non-Cognitive
Age Group	≤3 years	NE	N total	6	0
			% Caries Free	100.0	--
			N (dmft>0)	0	0
			Maximum	--	--
			Mean dmft>0	--	--
			Std. Deviation	--	--
		SE	N total	1	1
			% Caries Free	100.0	100.0
			N (dmft>0)	0	0
			Maximum	--	--
			Mean dmft>0	--	--
			Std. Deviation	--	--
	4-6 years	NE	N total	5	1
			% Caries Free	80.0	100.0
			N (dmft>0)	1	0
			Maximum	1	--
			Mean dmft>0	1.00	--
			Std. Deviation	--	--
		SE	N total	19	4
			% Caries Free	73.7	100.0
			N (dmft>0)	5	0
			Maximum	7	--
			Mean dmft>0	4.00	--
			Std. Deviation	2.449	--
	≥7 years	NE	N total	2	0
			% Caries Free	100.0	--
			N (dmft>0)	0	0
			Maximum	--	--
			Mean dmft>0	--	--
			Std. Deviation	--	--
		SE	N total	16	3
			% Caries Free	75.0	100.0
			N (dmft>0)	4	0
			Maximum	4	--
			Mean dmft>0	2.00	--
			Std. Deviation	1.414	--

4.2.2.4 Dental Caries and Water Fluoridation

An important aspect when analysing dental caries prevalence in areas with adjusted water fluoridation levels, is to measure the potential impact of water fluoridation on dental health. Of the total population of approximately 4.2 million in the Republic of Ireland, approximately 72 percent reside in water fluoridated communities. For that reason, comparison of dental caries levels between children residing in fluoridated communities and children who live in homes not connected to the public water supply may give an important indication as to the effect of this preventive measure. Baseline data were used for the present analysis as the

baseline examination had the largest participation level on the cut-off date (31.12.2009).

In the HSE North-East the non-parametric Mann-Whitney U test showed no statistically significant difference between baseline dmft mean ranks of pre-school children with disabilities who resided life-long in homes connected to the public water supply and their peers whose homes were not connected to the public water supply (*p*-value equals 0.977). Similar, in the HSE South-East the non-parametric Mann-Whitney U test showed no statistically significant difference between baseline dmft mean ranks of children who resided life-long in homes connected to the public water supply and children who's homes were not connected to the public water supply (*p*-value equals 0.818). This indicates that there was no statistically significant difference in dmft levels between pre-school children with disabilities who reside in homes connected to the public water supply and when compared with children whose homes were not connected to the public water supply in the two regions.

4.2.2.5 Dental Caries Prevalence Stratified by Deprivation Status

The SAHRU Deprivation Index provides a score between 1 to 10 for each electoral division (ED) and the last two deciles (i.e. deprivation score 9 and 10) were considered as deprived EDs in the present analysis. In order to allow comparison of the data, children were grouped in the following two categories: children residing in a non-deprived ED (i.e. deprivation score ≤ 8) and children residing in a deprived ED (deprivation score 9 and 10) (Table 4.67).

Table 4.67: Baseline Key Dental Caries Data In All Children Examined And Children With dmft>0 (No. of Children (N), Mean dmft, Standard Deviation (SD) And Range) In The HSE North-East And HSE South-East Stratified By Deprivation Status Of ED

		HSE North-East		HSE South-East	
		Non-Deprived ED	Deprived ED	Non-Deprived ED	Deprived ED
All Children	N	157	24	114	31
	Mean dmft	0.37	0.63	0.68	0.65
	SD	1.302	1.469	1.627	1.355
	Range	8	5	8	6
	Rank	90.26	95.85	72.04	76.52
Children with dmft>0	N	17	4	24	9
	Mean dmft	3.41	3.75	3.21	2.22
	SD	2.347	0.957	2.126	1.716
	Range	7	4	7	5

Analyses based on the deprivation status of the ED and on calculation of mean dmft levels in children with positive score (dmft>0) made transparent that only a marginal variation in dental caries prevalence existed between children residing in

non-deprived EDs and their peer residing in deprived EDs in the HSE North-East. Furthermore, dental caries prevalence in children residing in non-deprived EDs in the HSE South-East was very similar to the findings in children in the HSE North-East. However, mean dmft in children with positive score (dmft>0) who reside in deprived EDs in the HSE South-East were found to be lower than in the other three subgroups.

Furthermore, grouping into the categories 'Non-Deprived ED' and 'Deprived ED' allowed the application of a non-parametric rank sum test for further analysis (see Table 4.67 for ranks). The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children residing in a non-deprived ED and children residing in a deprived ED in the HSE North-East (*p*-value equals 0.619). The non-parametric Mann-Whitney U test showed no statistically significant difference between dmft mean ranks of children residing in a non-deprived ED and children residing in a deprived ED in the HSE South-East (*p*-value equals 0.474).

In order to examine the baseline data further, Fisher's exact test was used to examine the association between deprivation status and children with no caries (dmft=0) and children with some caries experience (dmft>0) at baseline in the HSE North-East and the South-East (Table 4.68).

Table 4.68: Baseline dmft Breakdown In 'No dmft Score' (dmft=0) And 'Combined dmft Scores' (dmft>0) In The HSE North-East And HSE South-East Stratified By Deprivation Status Of ED

	Non-Deprived ED		**Deprived ED**	
	dmft=0	dmft>0	dmft=0	dmft>0
North-East	140	17	20	4
South-East	90	24	22	9

Fisher's exact test demonstrated for the HSE North-East that the association between deprivation status ('Non-Deprived ED' – 'Deprived ED') and dental caries status ('dmft=0' – 'dmft>0') was not statistically significant (the two-tailed *p*-value equals 0.4897). For the HSE South-East demonstrated Fisher's exact test that the association between deprivation status ('Non-Deprived ED' – 'Deprived ED') and dental caries status ('dmft=0' – 'dmft>0') was not statistically significant (the two-tailed *p*-value equals 0.3441)

4.2.3 Visual Changes in the Appearance of Enamel

In order to measure visual changes in the appearance of enamel, the Developmental Defects of Enamel Index (DDE) was used. The changes in

enamel, i.e. the occurrence of opacities are classified into six categories, namely Demarcated Opacity (1), Diffuse Opacity (2), Hypoplastic Enamel (3) and the combinations Demarcated/Diffuse (4), Demarcated/Hypoplastic (5) and Diffuse/Hypoplastic (6). In order to allow meaningful statistical analysis of the data, these six categories were aggregated into one single category ('At least one DDE score'). Baseline data were used for the present analysis as the baseline examination had the largest participation level on the cut-off date (31.12.2009). Analysis of the baseline data demonstrated that approximately 71.7 percent of the total sample had a normal DDE score. However, a regional breakdown revealed a regional variation in aggregated DDE scores (i.e. 'At least one DDE score'): in the HSE North-East approximately 56.1 percent (N = 110) of the children showed a normal DDE score, whereas in the HSE South-East approximately 92.6 percent (N = 139) of the children showed a normal DDE score. Table 4.69 provides an overview of the distribution of these aggregated DDE scores stratified in children connected to public water Supply and children not connected to public water supply.

Table 4.69: Baseline Result Breakdown In 'No DDE Score' And 'At Least One DDE Score' For Children Connected To Public Water Supply ('Connected PWS') And Children Not Connected To Public Water Supply ('Not Connected PWS') In The HSE North-East And HSE South-East

	HSE North-East		HSE South-East	
	Connected PWS	Not Connected PWS	Connected PWS	Not Connected PWS
No DDE score (any opacity)	51.7% (74)	67.9% (36)	90.4% (113)	100.0% (25)
At least one DDE score	48.3% (69)	32.1% (17)	9.6% (12)	0.0% (0)

Fisher's exact test was used to examine the association in aggregated DDE scores between children whose homes were connected to the public water supply and children whose homes were not connected to the public water supply in the HSE North-East and the HSE South-East at baseline (Table 4.69). The difference in aggregated DDE scores between children whose homes were connected to the public water supply and children whose homes were not connected to the public water supply in the HSE North-East did not reach quite statistical significance (the two-tailed *p*-value equals 0.0519). However, the *p*-value may indicate that that there were two distinct groups of children in the HSE North-East and that children who resided in homes connected to the public water supply showed a higher count in aggregated DDE scores. Fisher's exact test was used to examine the association in at least one DDE score between children whose homes were connected to the public water supply and children whose homes were not

connected to the public water supply in the HSE South-East as well (Table 4.69). The difference in aggregated DDE scores between children whose homes were connected to the public water supply and children whose homes were not connected to the public water supply in the HSE South-East was not statistically significant (the two-tailed *p*-value equals 0.2186). A markedly lower number of children in the HSE South-East showed at least one DDE score when compared to the HSE North-East.

4.2.4 Application of Fissure Sealants

Analysis of the clinical data revealed that no fissure sealants, neither resin-based sealants/composites nor glass ionomer cements, were found on primary molar teeth. Furthermore, the clinical data demonstrated that at baseline in the HSE North-East three children and in the HSE South-East seven children showed at least one fissure sealant on their permanent molar teeth. This count in children with at least one fissure sealant increased only marginally at the second examination. In the HSE North-East eleven children and in the HSE South-East nine children showed at least one fissure sealant on their permanent molar teeth. These findings demonstrate low levels of fissure sealant application in this group of the child population.

4.2.5 Oral Hygiene Assessment

The clinical examination of the children included an assessment of the oral hygiene status and a decision on the need for parental oral hygiene instruction (OHI) or the need for parental OHI together with professional plaque and / or additional calculus removal. The following criteria were applied for the oral hygiene assessment:

No treatment required:	the child had excellent oral hygiene
OHI required:	visual plaque was present, but calculus was visually not detectable
OHI & plaque or OHI & plaque & calculus removal required:	gross visual plaque and acute gingivitis or visual plaque and calculus were present

In addition, 'urgent referral' was deemed required when, due to the condition of the periodontal tissues, irreversible damage was likely, i.e. 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.

4.2.5.1 Baseline Results

Of the total of 346 examined pre-school children with disabilities, 44.5 percent were considered to require no treatment, 33.2 percent required OHI, and 21.4 percent were considered to need OHI and plaque removal or plaque and calculus removal (Table 4.70). In addition, Table 4.70 gives a breakdown of the findings in the two regions. It appeared that the percentage of children considered to have excellent oral hygiene was higher in the HSE South-East (53.3%) when compared with the results for the HSE North-East (37.8%). The need for 'urgent referral' was deemed to be rarely required in either region.

Table 4.70: Baseline Oral Hygiene Assessment Results: Total Sample, HSE North-East And South-East

		Oral Hygiene Assessment				
		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Total	N	154	115	74	3	346
	%	44.5	33.2	21.4	0.9	100
North-East	N	74	78	41	3	196
	%	37.8	39.8	20.9	1.5	100
South-East	N	80	37	33	--	150
	%	53.3	24.7	22.0	--	100

4.2.5.1.1 Results Stratified by Age

The data are presented stratified in the following three age groups: three years of age or younger ('≤3-year-olds'), '4-6-year-olds' and seven years of age or older ('≥7-year-olds') (Table 4.71). The breakdown demonstrated a declining trend in the proportion of children considered not to require treatment, i.e. the proportion of children considered not to require treatment was greatest in the youngest age group and smallest in the oldest age group. Furthermore, this breakdown confirmed the low need for 'urgent referral' throughout all age groups.

Table 4.71: Baseline Oral Hygiene Assessment Results Stratified By Age Groups

		Oral Hygiene Assessment				
Age		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	N	67	51	9	1	128
	%	52.3	39.9	7.0	0.8	100
4-6	N	65	55	45	1	166
	%	39.2	33.1	27.1	0.6	100
≥7	N	15	9	18	1	43
	%	34.9	20.9	41.9	2.3	100

Table 4.72 shows the baseline oral hygiene assessment results for the three age groups in the HSE North-East and HSE South-East seperately. As demonstrated before, considerably more children in the HSE South-East were assessed not requiring any treatment when compared with their peers in the HSE North-East. Furthermore, in both regions there was a declining trend in the proportion of children considered not to require treatment, i.e. the proportion of children considered not to require treatment was greatest in the youngest age group and smallest in the oldest age group. However, this gradient was more pronounced in the HSE North-East.

Table 4.72: Baseline Oral Hygiene Assessment Results: HSE South-East (NE) And HSE South-East (SE) Stratified By Age Group

			Oral Hygiene Assessment				
Age	Region		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	NE	N	49	44	7	1	101
		%	48.5	43.6	6.9	1.0	100
	SE	N	18	7	2	0	27
		%	66.7	25.9	7.4	7.4	100
4-6	NE	N	21	34	25	1	81
		%	25.9	42.0	30.9	1.2	100
	SE	N	44	21	20	0	85
		%	51.8	24.7	23.5	0.0	100
≥7	NE	N	1	0	7	1	9
		%	11.1	0.0	77.8	11.1	100
	SE	N	14	9	11	0	34
		%	41.2	26.5	32.4	0.0	100

In order to examine the baseline data further, Fisher's exact test was used to examine the association between children with no treatment need (Tx=0) and children who required treatment (Tx=1) between the HSE North-East (NE) and the South-East (SE) (Table 4.73).

Table 4.73: Baseline Results Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Baseline		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	49	52	21	60	1	8
	SE	18	9	44	41	14	20
	p	0.1287		0.0008		0.1286	

Fisher's exact test revealed that there was no statistically significant difference for children aged three year or younger ('≤3-year-olds') and children aged seven years or older ('≥7-year-olds'). However, in children aged between four to six years ('4-6-year-olds') a statistically significant difference between children with 'no treatment need' and children with 'some treatment required' between the HSE North-East (NE) and the South-East (SE) was found (Table 4.73). These results suggest that a real difference in the periodontal health in children in this age group ('4-6-year-olds') between the HSE North-East and HSE South-East existed at baseline.

4.2.5.1.2 Results Stratified by Disability

As the type of disability may influence the level of oral hygiene in pre-school children, it is valuable to investigate oral hygiene levels in these children according to their disability. All children were classified in the five disability groups as previously described (Section 4.2.1.2). Table 4.74 demonstrates that the proportion of children with a cognitive disability, the largest disability group, who were considered to have excellent oral hygiene, was considerably higher in the HSE South-East when compared with the HSE North-East. Furthermore, HSE South-East data revealed that the proportion of children with excellent oral hygiene was lower in children with a cognitive disability when compared with the other disability groups. The need for 'urgent referral' was considered to be rarely required in any disability group in either region.

Table 4.74: Baseline Oral Hygiene Assessment Results: HSE South-East (NE) And HSE South-East (SE) Stratified By Disability

Disability			Oral Hygiene Assessment				
			No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Cognitive	NE	N	31	57	33	2	123
		%	25.2	46.3	26.9	1.6	100
	SE	N	49	25	21	--	95
		%	51.6	26.3	22.1	--	100
Physical	NE	N	11	4	5	--	20
		%	55.0	20.0	25.0	--	100
	SE	N	8	2	5	--	15
		%	53.3	13.3	33.4	--	100
Cognitive & Med. Comp.	NE	N	19	13	2	--	34
		%	55.9	38.2	5.9	--	100
	SE	N	3	1	2	--	6
		%	50.0	16.7	33.4	--	100
Medically Comp.	NE	N	--	3	--	--	3
		%	--	100.0	--	--	100
	SE	N	5	1	2	--	8
		%	62.5	12.5	25.0	--	100
Not diagnosed	NE	N	13	1	1	1	16
		%	81.3	6.3	6.3	6.3	100
	SE	N	15	8	3	--	26
		%	57.7	30.8	11.5	--	100

In order to allow better comparison of the data, children were then grouped in the following two disability categories: children with a cognitive disability ('cognitive disability' and 'cognitive disability & medically compromised' were merged) and children with a non-cognitive disability ('physical disability', 'medically compromised' and 'not diagnosed' were merged). In addition, the data were differentiated into children with no treatment need (Tx=0) and children who required treatment (Tx=1). Fisher's exact test was used to examine the baseline results for these two disability groups in the two regions (Table 4.75).

Table 4.75: Baseline Results Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In The HSE North-East (NE) And HSE South-East (SE) Stratified By Disability Group

Baseline	Cognitive Disability		Non-Cognitive Disability	
	Tx=0	Tx=1	Tx=0	Tx=1
NE	50	157	24	15
SE	52	49	28	21
p	0.0001		0.8275	

Fisher's exact test suggests that a real difference in baseline oral hygiene assessment results in children with a cognitive disability existed between the HSE North-East and HSE South-East (Table 4.75). Furthermore, no such difference was found in children with a non-cognitive disability.

4.2.5.1.3 Results in 2nd Examination Attendees Stratified by Age

In order to examine the development of dental health patterns over time, a subgroup of participants was selected, which consisted of children who were examined at baseline and who attended the second examination as well (see Figure 4.2 for the analysis plan of the quantitative data). Table 4.76 presents the oral hygiene assessment results at baseline in this subgroup of children stratified by age group ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') for the HSE North-East (NE) and HSE South-East (SE). Table 4.76 confirmed previously reported findings: more children in the HSE South-East were regarded not to require any treatment when compared with their peers in the HSE North-East; in both regions there was a declining trend in the proportion of children considered not to require treatment, i.e. younger children were found to have better oral hygiene levels than older children. Furthermore, this gradient was more pronounced in the HSE North-East.

Table 4.76: Baseline Oral Hygiene Assessment Results In 2nd Examination Attendees In The HSE South-East (NE) And HSE South-East (SE) Stratified By Age Group

			Oral Hygiene Assessment				
Age	Region		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	NE	N	19	26	3	1	49
		%	38.8	53.1	6.1	2.0	100
	SE	N	13	3	1	0	17
		%	76.5	17.6	5.9	0.0	100
4-6	NE	N	5	18	15	1	39
		%	12.8	46.2	38.5	2.6	100
	SE	N	26	12	15	0	53
		%	49.1	22.6	28.3	0.0	100
≥7	NE	N	0	0	4	0	4
		%	0.0	0.0	100.0	0.0	100
	SE	N	8	4	7	0	19
		%	42.1	21.1	36.8	0.0	100

In order to assess if there was any difference in baseline results between all children assessed at baseline (C1) and children who attended the second examination (C2) as well, the data were grouped in the following two categories: children with no treatment need (Tx=0) and children who required treatment (Tx=1). Fisher's exact test was used to examine the baseline results for these two subgroups (Table 4.77).

Table 4.77: Baseline Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In All Children Examined (C1) And 2nd Examination Attendees (C2) In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
HSE North-East		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	C1	49	52	21	60	1	8
	C2	19	30	5	34	0	4
	p	0.2967		0.1548		1.0000	
HSE South-East		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	C1	18	9	44	41	14	20
	C2	13	4	26	27	8	11
	p	0.7354		0.8613		1.0000	

Fisher's exact test revealed that there was no statistically significant difference in baseline results for any age group between all children assessed at baseline (C1) and those children who attended the second examination (C2) as well (Table 4.77). These results suggest that oral hygiene levels at baseline did not differ markedly between these two groups of children.

Fisher's exact test was then used to investigate the association between 'no treatment need required (Tx=0)' and 'oral hygiene instruction and/or some form of periodontal health related treatment required (Tx=1)' of these children (C2) between the HSE North-East (NE) and the South-East (SE) (Table 4.78).

Table 4.78: Baseline Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In 2nd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Baseline		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	19	30	5	34	0	4
	SE	13	4	26	27	8	11
	p	0.0108		0.0003		0.2569	

Fisher's exact test revealed at baseline a statistically significant difference in children aged three years or younger ('≤3-year-olds') and children aged between four to six years ('4-6-year-olds') between 'no treatment need (Tx=0)' and 'some treatment required (Tx=1)' between the HSE North-East (NE) and the South-East (SE) (Table 4.78). These results suggest that a real difference in baseline oral hygiene assessment results of children in these two age groups between the HSE North-East and HSE South-East existed and confirmed the previously presented findings for the whole sample (Table 4.73).

4.2.5.1.4 Results in 2nd Examination Attendees Stratified by Disability

A subgroup of participants was selected, which consisted of children who were examined at baseline and who attended the second examination as well (see Figure 4.2 for the analysis plan of the quantitative data). All children were

classified in five disability groups as described in section 4.2.2.1.2. Table 4.79 presents the baseline results for this subgroup of the sample population. Table 4.79 demonstrates that the proportion of children with a cognitive disability, the largest disability group, who were considered to have excellent oral hygiene, was considerably higher in the HSE South-East when compared with the HSE North-East. The need for 'urgent referral' was only required in two children with a cognitive disability in the HSE North-East.

Table 4.79: Baseline Oral Hygiene Assessment Results In 2nd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Disability

			Oral Hygiene Assessment				
			No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Cognitive	NE	N	14	31	19	2	66
		%	21.2	47.0	28.8	3.0	100
	SE	N	35	15	16	--	66
		%	53.0	22.7	24.3	--	100
Physical	NE	N	1	3	2	--	6
		%	16.7	50.0	33.4	--	100
	SE	N	5	1	4	--	10
		%	50.0	10.0	40.0	--	100
Cognitive & Med. Comp.	NE	N	9	8	1	--	18
		%	50.0	44.4	5.6	--	100
	SE	N	1	1	1	--	3
		%	33.3	33.3	33.3	--	100
Medically Comp.	NE	N	--	2	--	--	2
		%	--	100.0	--	--	100
	SE	N	3	1	--	--	6
		%	50.0	16.7	--	--	100
Not diagnosed	NE	N	1	--	--	--	1
		%	100.0	--	--	--	100
	SE	N	3	1	--	--	4
		%	75.0	25.0	--	--	100

In order to allow better comparison of the data, children were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability, in order to assess if there was any difference in baseline results between all children who attended the baseline examination (C1) and a subgroup of these children who attended the second examination (C2) as well. In addition, the data were grouped into children with no treatment need (Tx=0) and children who required treatment (Tx=1). Fisher's exact test was used to examine the baseline results for these two groups (Table 4.80) within one region.

Table 4.80: Baseline Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In All Children Examined (C1) And 2nd Examination Attendees (C2) In The HSE North-East And HSE South-East Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		Tx=0	Tx=1	Tx=0	Tx=1
North-East	C1	50	157	24	15
	C2	23	61	2	7
	p	05548		0.0607	
		Cognitive Disability		**Non-Cognitive Disability**	
		Tx=0	Tx=1	Tx=0	Tx=1
South-East	C1	52	49	28	21
	C2	36	33	11	9
	p	1.0000		1.0000	

Fisher's exact test revealed that there was no statistically significant difference in baseline results between all children assessed at baseline (C1) and a subgroup of these children who attended the second examination (C2) as well (Table 4.80). These results suggest that the dental health assessment results of this subgroup of children (C2) did not differ markedly from all children (C1) assessed at baseline. Fisher's exact test was then used to investigate in this subgroup of children (C2) the association between 'no treatment need required (Tx=0)' and 'oral hygiene instruction and/or some form of periodontal health related treatment required (Tx=1)' between the HSE North-East (NE) and the South-East (SE) (Table 4.81).

Table 4.81: Baseline Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In 2nd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		Tx=0	Tx=1	Tx=0	Tx=1
Baseline	NE	23	61	2	7
	SE	36	33	11	9
	p	0.0025		0.1296	

In children with a cognitive disability the difference in baseline scores for 'no treatment need' and 'some treatment required' between the HSE North-East (NE) and the South-East (SE) was statistically significant (the two-tailed *p*-value equals 0.0025). In children with a non-cognitive disability the difference in baseline scores for 'no treatment need' and 'some treatment required' between the HSE North-East (NE) and the South-East (SE) was considered to be not statistically significant (the two-tailed *p*-value equals 0.1296). These findings confirmed the existence of a real difference in dental health assessment results in children with a cognitive disability between the HSE North-East and HSE South-East.

4.2.5.2 Second Examination Results

Of the total of 182 examined pre-school children with disabilities, 20.9 percent were considered not to require any treatment, 43.4 percent were considered to required OHI, and 35.2 percent were considered to need OHI and plaque removal or plaque and calculus removal (Table 4.82). These findings demonstrated an actual shift towards lower periodontal health levels than reported for the previous year for the whole sample. Close examination of the findings revealed that this worsen in oral hygiene assessment results were due to lower periodontal health levels in the HSE North-East i.e. the intervention group. However, the need for 'urgent referral' was considered to be rarely required.

Table 4.82: 2nd Examination Oral Hygiene Assessment Results: Total Sample, HSE North-East And South-East

		Oral Hygiene Assessment				
		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Total	N	38	79	64	1	182
	%	20.9	43.4	35.2	0.5	100
North-East	N	5	56	31	1	93
	%	5.4	60.2	33.3	1.1	100
South-East	N	33	23	33	--	89
	%	37.1	25.8	37.1	--	100

4.2.5.2.1 Results Stratified by Age

The data are presented stratified into the three age groups ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') for the HSE North-East and HSE South-East (Table 4.83). This breakdown demonstrated a clear disparity in oral hygiene assessment results between the two regions. Only a marginal proportion of children in any age group in the HSE North-East were considered to have excellent oral hygiene whereas in the HSE South-East considerably higher number of children was found to have excellent oral hygiene levels. Furthermore, a declining gradient in the proportion of children considered not to require treatment became apparent in the HSE South-East, i.e. the proportion of children considered not to require treatment was greatest in the youngest age group and smallest in the oldest age group. However, only one child was found to need an 'urgent referral' for periodontal treatment.

Table 4.83: 2nd Examination Oral Hygiene Assessment Results: HSE South-East (NE) And HSE South-East (SE) Stratified By Age Group

			Oral Hygiene Assessment				
Age	Region		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	NE	N	2	26	5	0	33
		%	6.1	78.8	15.2	0.0	100
	SE	N	5	0	1	0	6
		%	83.3	0.0	16.7	0.0	100

4-6	NE	N	2	20	12	1	35
		%	5.7	57.1	34.3	2.9	100
	SE	N	15	12	11	0	38
		%	39.5	31.6	28.9	0.0	100
≥7	NE	N	0	9	12	0	21
		%	0.0	42.9	57.1	0.0	100
	SE	N	11	9	17	0	37
		%	29.7	24.3	45.9	0.0	100

In order to get a better insight to changes in oral hygiene levels in pre-school children with disabilities over time, it is useful to compare the second examination results for each age group with the baseline results for the same children (Table 84). Fisher's exact test was used to examine changes in assessment results between second examination and baseline examination results for each age group. Children with no treatment need (Tx=0) and children who required treatment (Tx=1) at the second examination and the baseline examination were compared within one region and between the two regions in this analysis. A small variation in total counts of children participating in the baseline and second examination may have occurred as the oral hygiene assessment was not completed in some children at one of the assessments and therefore were excluded from this analysis. However, this minor variation has not skewed the results.

Table 4.84: Baseline and 2nd Examination Oral Hygiene Assessment Result Breakdown In 'No Treatment Required' (Tx=0) And 'Treatment Required' (Tx=1): *p*-values Based On Fisher's Exact Test For The North-East (NE) And HSE South-East (SE) And Between The Two Regions Stratified By Age Group

		'≤3-year-olds'		**'4-6-year-olds'**		**'≥7-year-olds'**	
Baseline		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	19	30	5	34	0	4
	SE	13	4	26	27	8	11
		'≤3-year-olds'		**'4-6-year-olds'**		**'≥7-year-olds'**	
Second Examination		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	2	31	2	33	0	21
	SE	5	1	15	23	11	26
***p* (with each region)**	NE	0.0007		0.4350		1.0000	
	SE	1.0000		0.3994		0.3854	
***p* (between NE-SE)**		0.0002		0.0007		0.0047	

Fisher's exact test revealed that there was a statistically significant difference in the youngest age group ('≤3-year-olds') between baseline and second examination results in the HSE North-East (intervention group). No such difference was found in the other two age groups in the HSE North-East (intervention group) or for any age group in the HSE South-East (control group) (Table 4.84).

In addition, Fisher's exact test was used to examine the association between second examination results for children with no treatment need (Tx=0) and children who required treatment (Tx=1) between the HSE North-East and the HSE South-East. Fisher's exact test revealed (Table 4.84) that there was a statistically significant difference in oral hygiene assessment results in all age groups between the HSE North-East (intervention group) and HSE South-East (control group), which was due to the low counts of children with no treatment need (Tx=0) in the HSE North-East (intervention group).

4.2.5.2.2 Results Stratified by Disability

All children were classified in the five disability groups as previously described (Section 4.2.2.1.2). Table 4.85 demonstrates that the proportion of children with a cognitive disability (the largest disability group) considered to have excellent oral hygiene, was considerably higher in the HSE South-East when compared with the results for the HSE North-East. Furthermore, HSE South-East data revealed that the proportion of children with excellent oral hygiene was lower in children with a cognitive disability when compared with the other disability groups. The need for 'urgent referral' was considered to be rarely required.

Table 4.85: 2nd Examination Oral Hygiene Assessment Results: In The HSE South-East (NE) And HSE South-East (SE) Stratified By Disability

			Oral Hygiene Assessment				
			No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Cognitive	NE	N	3	39	23	1	66
		%	4.5	59.1	34.8	1.5	100
	SE	N	19	18	29	--	66
		%	28.8	27.3	43.8	--	100
Physical	NE	N	1	2	3	--	6
		%	16.7	33.3	50.0	--	100
	SE	N	5	3	2	--	10
		%	50.0	30.0	20.0	--	100
Cognitive & Med. Comp.	NE	N	1	13	4	--	18
		%	5.6	72.2	22.2	--	100
	SE	N	2	1	--	--	3
		%	66.7	33.3	--	--	100
Medically Comp.	NE	N	--	1	1	--	2
		%	--	50.0	50.0	--	100
	SE	N	4	1	1	--	6
		%	66.7	16.7	16.7	--	100
Not diagnosed	NE	N	--	1	--	--	1
		%	--	100.0	--	--	100
	SE	N	3	--	1	--	4
		%	75.0	--	25.0	--	100

The data were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability in order to

compare the third examination results for these two disability groups with the second examination results in the same children (Table 4.86).

McNemar's test was used to examine the changes in oral hygiene assessment results between second examination and baseline examination in children with no treatment need (Tx=0) and children who required treatment (Tx=1) within one region (Table 4.86).

Table 4.86: Baseline and 2nd Examination Oral Hygiene Assessment Result Breakdown In 'No Treatment Required' (Tx=0) And 'Treatment Required' (Tx=1): *p*-values Based On McNemar's Test And Fisher's Exact Test For The North-East (NE) And HSE South-East (SE) Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
Baseline		Tx=0	Tx=1	Tx=0	Tx=1
	NE	23	61	2	7
	SE	36	33	11	9
		Cognitive Disability		**Non-Cognitive Disability**	
Second Examination		Tx=0	Tx=1	Tx=0	Tx=1
	NE	4	80	1	8
	SE	21	48	12	8
***p* (McNemar's test)**	NE	0.0005		1.000	
	SE	0.015		1.000	
***p* (Fisher's exact test)**		0.0001		0.0200	

McNemar's test revealed (Table 4.86) a statistically significant difference in children with a cognitive disability in oral hygiene assessment results between baseline and second examination in the HSE North-East (intervention group). This finding suggest that a statistically significantly higher number of children with a cognitive disability in the intervention group (HSE North-East) were found to require oral hygiene instruction and/or some form periodontal health related treatment at the second examination when compared to the baseline results. No such change was observed in children with a non-cognitive disability in the HSE North-East (intervention group) and for any disability group in the HSE South-East (control group).

In addition, Fisher's exact test was used to examine the association between second examination results for children with no treatment need (Tx=0) and children who required oral hygiene instruction and/or some form of periodontal health related treatment (Tx=1) between the HSE North-East and the South-East. In both, children with a cognitive and a non-cognitive disability, the difference between baseline and second examination results between the HSE North-East and the South-East was statistically significant (the two-tailed *p*-value equals

0.0001 and 0.0200, respectively). This suggests a real difference in oral hygiene assessment results between the HSE North-East (intervention group) when compared to the HSE South-East (control group) and indicates a higher need for oral hygiene instruction and/or some form periodontal health related treatment at the second examination in the HSE North-East (intervention group) when compared to the HSE South-East (control group).

4.2.5.2.3 Results in 3rd Examination Attendees Stratified by Age

In order to examine the development of dental health patterns over time, a subgroup of participants was selected, which consisted of children who were assessed at second examination and who attended the third examination as well (see Figure 4.2 for the analysis plan of the quantitative data). Table 4.87 presents the oral hygiene assessment results at the second examination in this subgroup of children stratified by age group ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') for the HSE North-East and HSE South-East. Table 4.87 demonstrates that only 15 third examination datasets (clinical examination results and questionnaire) HSE North-East were entered on the database on the cut-off date (31.12.2009). For that reason, any further statistical analysis of HSE North-East data will be limited in its explanatory power. A declining gradient in the proportion of children considered not to require treatment became apparent in the HSE South-East, i.e. the proportion of children considered not to require treatment was greatest in the youngest age group (75.0%) but considerably lower in the two older age groups (25.0% and 33.3% respectively). However, no assessed child was found to need an 'urgent referral' for periodontal treatment.

Table 4.87: 2nd Examination Oral Hygiene Assessment Results In 3rd Examination Attendees In The HSE South-East (NE) And HSE South-East (SE) Stratified By Age Group

			Oral Hygiene Assessment				
Age	Region		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	NE	N	1	6	0	0	7
		%	14.3	85.7	0.0	0.0	100
	SE	N	3	0	1	0	4
		%	75.0	0.0	25.0	0.0	100
4-6	NE	N	0	3	2	0	5
		%	0.0	60.0	40.0	0.0	100
	SE	N	6	10	8	0	24
		%	25.0	41.7	33.5	0.0	100
≥7	NE	N	0	3	0	0	3
		%	0.0	100.0	0.0	0.0	100
	SE	N	5	3	7	0	15
		%	33.3	20.0	46.7	0.0	100

In order to assess if there were any differences in second examination results between all children who attended the second examination (C3) and those children who attended the third examination (C4) as well, the data were grouped in the following two categories: children with no treatment need (Tx=0) and children who required treatment (Tx=1). Fisher's exact test was used to examine the second examination results for these two subgroups within each region (Table 4.88).

Table 4.88: 2nd Examination Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In All Children Examined (C3) And 3rd Examination Attendees (C4) In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
HSE North-East		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	C3	2	31	2	33	0	21
	C4	1	6	0	5	0	3
	p	0.4478		1.0000		1.0000	
HSE South-East		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	C3	5	1	15	23	11	26
	C4	3	1	6	18	5	10
	p	1.0000		0.2815		1.0000	

Fisher's exact test revealed no statistically significant difference in second examination results for any age group between all children who attended second examination (C3) and a subgroup of these children who attended the third examination (C4) as well (Table 4.88). These results suggest that the second examination oral hygiene assessment results of children who attended the third examination (C4) did not differ markedly from all children examined at the second examination (C3).

Fisher's exact test was then used (Table 4.89) to examine the second examination results of those children who attended the third examination further in order to investigate if statistically significant difference in oral hygiene assessment results between the HSE North-East and the South-East exist.

Table 4.89: 2nd Examination Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In 3rd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
2nd Exam		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	1	6	0	5	0	3
	SE	3	1	6	18	5	10
	p	0.0879		0.5526		0.5221	

Fisher's exact test revealed that there was no statistically significant difference for any age group between children with 'no treatment need' and children with 'treatment required' between the HSE North-East and the South-East (Table 4.89).

These results suggest that the oral hygiene assessment results at the second examination of children who attended the third examination did not differ markedly between the two regions. However, explanatory power of this analysis is limited because of the restricted number of available datasets in the HSE North-East.

4.2.5.2.4 Results in 3rd Examination Attendees Stratified by Disability

A subgroup of participants was selected, which consisted of children who were examined at second examination and who attended the third examination as well (see Figure 4.2 for the analysis plan of the quantitative data). All children were classified in five disability groups as described in section 4.2.2.1.2. Table 4.90 presents the second examination results for this subgroup of the sample population. Table 4.90 demonstrates that only 15 datasets HSE North-East were identified for inclusion in this analysis. For that reason, any further statistical analysis of HSE North-East data will be limited in its explanatory power. Table 4.90 demonstrates that only one child in the HSE North-East was considered to have excellent oral hygiene. HSE South-East data revealed that the proportion of children with excellent oral hygiene was lower in children with a cognitive disability when compared with the other disability groups. The need for 'urgent referral' was only required in two children with a cognitive disability in the HSE North-East.

Table 4.90: 2nd Examination Oral Hygiene Assessment Results In 3rd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Disability

			Oral Hygiene Assessment				
			No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Cognitive	NE	N	--	8	2	--	10
		%	--	80.0	20.0	--	100
	SE	N	10	10	15	--	35
		%	28.6	28.6	42.9	--	100
Physical	NE	N	--	1	--	--	1
		%	--	100.0	--	--	100
	SE	N	3	2	2	--	7
		%	42.9	28.6	28.6	--	100
Cognitive & Med. Comp.	NE	N	1	3	--	--	4
		%	25.0	75.0	--	--	100
	SE	N	1	1	--	--	2
		%	50.0	50.0	--	--	100
Medically Comp.	NE	N	--	--	--	--	--
		%	--	--	--	--	--
	SE	N	1	1	--	--	2
		%	50.0	50.0	--	--	100
Not diagnosed	NE	N	--	--	--	--	--
		%	--	--	--	--	--
	SE	N	--	--	--	--	--
		%	--	--	--	--	--

In order to allow better comparison of the data, children were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability, in order to assess if there was any difference in second examination results between all children who attended the first and second examination (C3) and a subgroup of these children who attended the third examination (C4) as well. In addition, the data were grouped into children with no treatment need (Tx=0) and children who required oral hygiene instruction and/or some form of periodontal health related treatment (Tx=1). Fisher's exact test was used to examine the second examination results for these two groups (Table 4.91) within one region.

Table 4.91: 2nd Examination Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In All Children Examined (C3) And 3rd Examination Attendees (C4) In The HSE North-East And HSE South-East Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		Tx=0	Tx=1	Tx=0	Tx=1
North-East	C3	4	80	1	8
	C4	1	13	0	1
	p	0.5454		1.0000	
		Cognitive Disability		**Non-Cognitive Disability**	
		Tx=0	Tx=1	Tx=0	Tx=1
South-East	C3	21	48	12	8
	C4	11	26	4	5
	p	1.0000		0.6882	

Fisher's exact test revealed that there was no statistically significant difference in second examination results between all children who attended the first and second examination (C3) and a subgroup of these children who attended the third examination (C4) as well (Table 4.91). These results suggest that the periodontal health of this subgroup of children did not differ markedly from all children examined at the second examination and that later comparison of these second results with third examination results of these children will reflect their dental health development over time as a group.

Fisher's exact test was then used to examine the present second examination results of this subgroup of children (i.e. children who attended the third examination approximately 12 months later), in order to investigate the association between 'no treatment need required (Tx=0)' and 'oral hygiene instruction and/or some form of periodontal health related treatment required (Tx=1)' between the HSE North-East (NE) and the South-East (SE) (Table 4.92).

Table 4.92: 2nd Examination Result Breakdown In 'No Treatment Need' (Tx=0) And 'Treatment Required' (Tx=1) In 2nd Examination Attendees In The HSE North-East (NE) And HSE South-East (SE) Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
		Tx=0	Tx=1	Tx=0	Tx=1
Second Examination	NE	1	13	0	1
	SE	11	26	4	5
	p	0.1418		1.0000	

In children with a cognitive disability the difference in second examination scores for 'no treatment need' and 'some treatment required' between the HSE North-East (NE) and the South-East (SE) was not statistically significant (the two-tailed *p*-value equals 0.1418). In children with a non-cognitive disability the difference in second examination scores for 'no treatment need' and 'some treatment required' between the HSE North-East (NE) and the South-East (SE) was considered to be not statistically significant (the two-tailed *p*-value equals 1.0000).

4.2.5.3 Third Examination Results

Of the 61 examined pre-school children with disabilities who attended the third examination, 32.3 percent were considered not to require any treatment, 38.7 percent required OHI, and 29.0 percent were considered to need OHI and plaque removal or plaque and calculus removal (Table 4.93). The need for 'urgent referral' was not required in this group of children.

Table 4.93: 3rd Examination Oral Hygiene Assessment Results: Total Sample, HSE North-East And South-East

		Oral Hygiene Assessment				
		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Total	N	20	24	18	--	62
	%	32.3	38.7	29.0	--	100
North-East	N	1	13	1	--	15
	%	6.7	86.7	6.7	--	100
South-East	N	18	11	17	--	46
	%	39.1	23.9	37.0	--	100

4.2.5.3.1 Results Stratified by Age

Table 4.94 presents the oral hygiene assessment results at the third examination of children stratified by age group ('≤3-year-olds', '4-6-year-olds' and '≥7-year-olds') for the HSE North-East and HSE South-East. One dataset from the HSE North-East and two datasets from the HSE South-East had to be excluded from this analysis due to incomplete information. Furthermore, the statistical analysis of HSE North-East data is limited in its explanatory power because of the restricted number of available datasets. A declining gradient in the proportion of children

considered not to require treatment became apparent in the HSE South-East, i.e. the proportion of children considered not to require treatment was greatest in the youngest age group (50.0%) but lower in the two older age groups (30.4% and 42.1% respectively). Furthermore, the results for the HSE South-East show improved oral hygiene assessment results in the two older age groups ('4-6-year-olds' and '≥7-year-olds') when compared to the previous year in the same group of children. In addition, no assessed child was found to need an 'urgent referral' for periodontal treatment.

Table 4.94: 3rd Examination Oral Hygiene Assessment Results: HSE South-East (NE) And HSE South-East (SE) Stratified By Age Group

			Oral Hygiene Assessment				
Age	Region		No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
≤3	NE	N	1	5	0	0	6
		%	16.7	83.3	0.0	0.0	100
	SE	N	1	0	1	0	2
		%	50.0	0.0	50.0	0.0	100
4-6	NE	N	0	5	1	0	6
		%	0.0	83.3	16.7	0.0	100
	SE	N	7	8	8	0	23
		%	30.4	34.8	34.8	0.0	100
≥7	NE	N	0	2	0	0	2
		%	0.0	100.0	0.0	0.0	100
	SE	N	8	3	8	0	19
		%	42.1	15.8	42.1	0.0	100

In order to get a better insight to changes in oral hygiene levels in pre-school children with disabilities over time, it is worth to compare the third examination results for each age group with the second results for the same children (Table 95). Fisher's exact test was then used to examine in the changes in assessment results between third and second examination for each age group. Children with no treatment need (Tx=0) and children who required treatment (Tx=1) at baseline and at the second examination were compared within one region and between the two regions in this analysis.

Table 4.95: 2nd and 3rd Examination Oral Hygiene Assessment Result Breakdown In 'No Treatment Required' (Tx=0) And 'Treatment Required' (Tx=1): *p*-values Based On Fisher's Exact Test For The North-East (NE) And HSE South-East (SE) And Between The Two Regions Stratified By Age Group

		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Second Examination		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	1	6	0	5	0	3
	SE	3	1	6	18	5	10
		'≤3-year-olds'		'4-6-year-olds'		'≥7-year-olds'	
Third Examination		Tx=0	Tx=1	Tx=0	Tx=1	Tx=0	Tx=1
	NE	1	5	0	6	0	2
	SE	1	1	7	16	8	11
***p* (within each region)**	NE	1.0000		1.0000		1.0000	
	SE	1.0000		0.7516		0.7282	
***p* (between NE-SE)**		0.4643		0.2885		0.5048	

Fisher's exact test revealed that there was no statistically significant difference for any age group between third examination results for children with no treatment need (Tx=0) and children who required oral hygiene instruction and/or some form periodontal health related treatment (Tx=1) and second examination results within each region (Table 4.95).

In addition, Fisher's exact test was used to examine the third examination results for children with no treatment need (Tx=0) and children who required treatment (Tx=1) between the HSE North-East and the South-East. Fisher's exact test revealed that there was no statistically significant difference for any age group between the HSE North-East and HSE South-East recorded at the third examination (Table 4.95). However, explanatory power of this analysis is limited because of the restricted number of available datasets in the HSE North-East.

4.2.5.3.2 Results Stratified by Disability

All children were classified in the five disability groups as previously described (Section 4.2.2.1.2). Table 4.96 demonstrates that only one child in the HSE North-East was considered to have excellent oral hygiene. HSE South-East data revealed that the proportion of children with excellent oral hygiene was lower in children with a cognitive disability when compared with the other disability groups. The need for 'urgent referral' was not required in any of the children assessed.

Table 4.96: 3rd Examination Oral Hygiene Assessment Results: HSE South-East (NE) And HSE South-East (SE) Stratified By Disability

			Oral Hygiene Assessment				
			No treatment required	OHI required	OHI & plaque or plaque & calculus removal required	Urgent referral required	Total
Cognitive	NE	N	--	9	1	--	10
		%	--	90.0	10.0	--	100
	SE	N	12	9	14	--	35
		%	34.3	25.7	40.0	--	100
Physical	NE	N	--	1	--	--	1
		%	--	100.0	--	--	100
	SE	N	5	1	--	--	6
		%	83.3	16.6	--	--	100
Cognitive & Med. Comp.	NE	N	1	3	--	--	4
		%	25.0	75.0	--	--	100
	SE	N	--	--	2	--	2
		%	--	--	100.0	--	100
Medically Comp.	NE	N	--	--	--	--	--
		%	--	--	--	--	--
	SE	N	1	1	--	--	2
		%	50.0	50.0	--	--	100
Not diagnosed	NE	N	--	--	--	--	--
		%	--	--	--	--	--
	SE	N	--	--	--	--	--
		%	--	--	--	--	--

The data were then grouped in the following two disability categories: children with a cognitive disability and children with a non-cognitive disability in order to compare the third examination results for these two disability groups with the second examination results in the same children (Table 4.96).

McNemar's test was used to examine in more detail the changes in oral hygiene assessment results between third examination and second examination in children with no treatment need (Tx=0) and children who required treatment (Tx=1) within one region (Table 4.97).

Table 4.97: 2nd and 3rd Examination Oral Hygiene Assessment Result Breakdown In 'No Treatment Required' (Tx=0) And 'Treatment Required' (Tx=1): *p*-values Based On McNemar's Test And Fisher's Exact Test For The North-East (NE) And HSE South-East (SE) Stratified By Disability Group

		Cognitive Disability		Non-Cognitive Disability	
Second Examination		Tx=0	Tx=1	Tx=0	Tx=1
	NE	1	13	0	1
	SE	11	26	4	5
Third Examination		**Cognitive Disability**		**Non-Cognitive Disability**	
		Tx=0	Tx=1	Tx=0	Tx=1
	NE	1	13	0	1
	SE	12	25	6	3
***p* (McNemar's test)**	NE	1.000		*not enough cases*	
	SE	1.000		0.500	
***p* (Fisher's exact test)**		0.0817		0.0400	

McNemar's test revealed that there was no statistically significant difference for any of the two disability groups between second examination and third examination results for children with no treatment need (Tx=0) and children who required oral hygiene instruction and/or some form periodontal health related treatment (Tx=1) within a region (Table 4.97).

In addition, Fisher's exact test was used to examine the association between third examination results for children with no treatment need (Tx=0) and children who required oral hygiene instruction and/or some form of periodontal health related treatment (Tx=1) between the HSE North-East and the South-East. In children with a cognitive disability the difference in third examination results between the HSE North-East (NE) and the South-East (SE) was not statistically significant (the two-tailed p-value equals 0.0817). In children with a non-cognitive disability the difference in third examination results between the HSE North-East (NE) and the South-East (SE) was statistically significant (the two-tailed p-value equals 0.0400).

4.2.6 Toothwear

'Toothwear' is used in this context to describe all non-carious loss of tooth tissue, which may have occurred due to erosion (dissolution of teeth by acids), attrition (wear of tooth against tooth) or abrasion (wear of teeth from other factors), and possibly abfraction (non-carious loss of cervical tooth tissue possibly associated with occlusal loading).

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 (Whelton et al., 2006). The present study aimed to record erosion; however, as a clear distinction from the other types of toothwear appeared to be difficult in this distinct group of children. For that reason, the results should be interpreted as collective signs of toothwear rather than erosion only. Table 4.98 presents the number of children with at least one index tooth affected by toothwear and their proportion in relation to the respective sample in the two regions.

Table 4.98: Number Of Children With At Least One Tooth Affected By Toothwear

		HSE North-East		HSE South-East	
		N	% of Sample	N	% of Sample
Baseline	All Children	45	23.0	47	31.3
	2nd Exam Attendees	15	16.1	31	34.8
2nd Examination	All Children	36	38.7	19	21.3
	3rd Exam Attendees	4	26.7	13	28.3
3rd Examination	All Children	5	33.3	9	19.6

4.2.7 Trauma

Upper and lower primary or permanent incisors were examined for traumatic injuries. Analysis of the clinical data revealed that signs of trauma were low in the sample population and limited to primary teeth. At baseline, 29 children were found to have signs of trauma to their front teeth, with the majority of them demonstrating discolouration. Table 4.99 provides an overview of baseline data on traumatic injuries of upper and lower primary incisors.

Table 4.99: Baseline Number Of Children With At Least One Primary Incisor Tooth With Traumatic Injury

	HSE North-East		HSE South-East	
	No. of Children	% of the Sample	No. of Children	% of the Sample
Normal	176	89.7	141	94.0
Discolouration	7	3.6	2	1.3
Enamel Fracture (not restored)	6	3.1	2	1.3
Enamel & Dentine Fracture (not restored)	5	2.6	1	0.7
Enamel, Dentine & Pulp Fracture (not restored)	--	--	1	0.7
Missing Due to Trauma	2	1.0	3	2.0

Further analysis of the data demonstrated that in the HSE North-East only four children in the age group three-years or younger ('≤3-year-olds') showed traumatic injuries of upper and lower primary incisors and in the HSE South-East only two children in this age group had traumatic injuries of primary incisors. None of the affected teeth in either region showed signs of any restoration.

4.2.8 Selected Questionnaire Results

The questionnaire (Appendix C) contained several questions that aimed to capture parents / caregivers dental health behaviour, attitudes and knowledge in the two regions. All parents / caregivers were required to fill out one of these questionnaires each time they attended with their child one of the three examinations. In order to insure that information on the different themes investigated were correctly captured similar questions were asked to one theme. For that reason, this section provides a selection of questionnaire results in order to display the whole spectrum of themes investigated but to limit duplications.

4.2.8.1 Question 2 (Dental Health Related Knowledge)

The questionnaire contained several questions that aimed to capture parents / caregivers dental health related knowledge. Table 4.100 demonstrated a high level of existing dental health related knowledge in both regions with a marginally higher knowledge base in the HSE South-East. Interestingly, the distribution of answers did not change in the HSE North-East (intervention group) between the baseline examination and the second examination (i.e. after one year of exposure to the dental health prevention programme).

Table 4.100: Question: 'Putting A Child To Bed With Juice In A Bottle Can Cause tooth Decay'

'Putting a child to bed with juice in a bottle can cause tooth decay'							
		HSE North-East			**HSE South-East**		
		True	False	Don't know	True	False	Don't know
Baseline	≤3yrs	97.4% (37)	2.6% (1)	--	100% (22)	--	--
	4-6yrs	90.9% (20)	9.1% (2)	--	98.2% (55)	1.8% (1)	--
	≥7yrs	100% (6)	--	--	100% (28)	--	--
2nd Exam	≤3yrs	100% (30)	--	--	100% (5)	--	--
	4-6yrs	87.5% (21)	8.3% (2)	4.2% (1)	100% (33)	--	--
	≥7yrs	88.9% (16)	11.1% (2)	--	100% (33)	--	--
3rd Exam	≤3yrs	100% (6)	--	--	100% (2)	--	--
	4-6yrs	100% (3)	--	--	100% (23)	--	--
	≥7yrs	100% (2)	--	--	100% (19)	--	--

4.2.8.2 Question 4 (Dental Health Related Knowledge)

This question investigated parental dental health related knowledge further. The answers confirmed that parents / caregivers of pre-school children with disabilities had a high level of dental health related knowledge in the two regions from the start of the study (baseline) and with no apparent change over the duration of the project in either region (Table 4.101).

Table 4.101: Question: 'Tooth Brushing Prevents Tooth Decay'

'Tooth brushing prevents tooth decay'							
		HSE North-East			**HSE South-East**		
		True	False	Don't know	True	False	Don't know
Baseline	≤3yrs	89.5% (34)	10.5% (4)	--	90.9% (20)	4.5% (1)	4.5% (1)
	4-6yrs	92.9% (21)	--	4.5% (1)	94.6% (53)	5.4% (3)	--
	≥7yrs	100% (6)	--	--	96.4% (27)	3.6% (1)	--
2nd Exam	≤3yrs	96.7% (29)	3.3% (1)	--	100% (5)	--	--
	4-6yrs	91.7% (22)	4.2% (1)	4.2% (1)	87.9% (29)	9.1% (3)	3.0% (1)
	≥7yrs	94.4% (17)	--	5.6% (1)	100% (33)	--	--
3rd Exam	≤3yrs	100% (6)	--	--	100% (2)	--	--
	4-6yrs	100% (3)	--	--	87.0% (20)	13.0% (3)	--
	≥7yrs	100% (2)	--	--	94.7% (18)	--	5.3% (1)

4.2.8.3 Question 5 (Dental Health Related Knowledge)

This question continued to investigate the parental dental health related knowledge from a different angle. The given answers confirmed (Table 4.102) existing high levels of dental health related knowledge in parents / caregivers of pre-school children with disabilities in the two regions. Furthermore, the present findings demonstrated that the distribution pattern of answers did not change in the HSE North-East (intervention group) between the baseline examination and the second examination.

Table 4.102: Question: 'You Should Brush Your Child's Teeth After Each Meal To Prevent Decay'

'You should brush your child's teeth after each meal to prevent decay'							
		HSE North-East			**HSE South-East**		
		True	False	Don't know	True	False	Don't know
Baseline	≤3yrs	76.3% (29)	21.1% (8)	2.6% (1)	95.5% (21)	4.5% (1)	--
	4-6yrs	81.8% (18)	13.6% (3)	4.5% (1)	92.9% (52)	7.1% (4)	--
	≥7yrs	--	50.0% (2)	50.0% (2)	82.1% (23)	14.3% (4)	3.6% (1)
2nd Exam	≤3yrs	80.0% (24)	16.7% (5)	3.3% (1)	80.0% (4)	--	20.0% (1)
	4-6yrs	70.8% (17)	20.8% (5)	8.3% (2)	93.9% (31)	--	6.1% (2)
	≥7yrs	55.6% (10)	27.8% (5)	16.7% (3)	90.9% (30)	9.1% (3)	--
3rd Exam	≤3yrs	83.3% (5)	16.7% (1)	--	100% (2)	--	--
	4-6yrs	66.7% (2)	33.3% (1)	--	95.7% (22)	4.3% (1)	--
	≥7yrs	50.0% (1)	50.0% (1)	--	94.7% (18)	5.3% (1)	--

4.2.8.4 Question 9 (Commencement of Toothbrushing)

Current general recommendations on toothbrushing suggest brushing teeth when they come through with a tooth brush and tap water (Forum on Fluoridation, 2002). This question investigated the level of familiarity with the first part of this recommendation i.e. recorded the existing the knowledge concerning the time when to commence toothbrushing. The present findings (Table 4.103) demonstrated that the majority of parents / caregivers of pre-school children with disabilities appreciate current recommendations. However, it became apparent that the awareness of this issue increased in the HSE North-East (intervention group), where almost all parents / caregivers thought that children's teeth should be brushed when they come through after one year of exposure to the dental health prevention programme, whereas the knowledge base remained comparable in the HSE South-East (control group).

Table 4.103: Question: 'At What Age Do You Think That You Should Start To Brush Children's Teeth?

'At what age do you think that you should start to brush children's teeth?'											
		HSE North-East					**HSE South-East**				
		Come through	<1 year	1-2 years	>2 years	Don't know	Come through	<1 year	1-2 years	>2 years	Don't know
Baseline	≤3yrs	81.6% (31)	2.6% (1)	13.2% (3)	2.6% (1)	--	86.4% (19)	--	4.5% (1)	9.1% (2)	--
	4-6yrs	77.3% (17)	--	4.5% (1)	9.1% (2)	--	67.9% (38)	10.7% (6)	10.7% (6)	10.7% (6)	--
	≥7yrs	100% (6)	--	--	--	--	78.6% (22)	3.6% (1)	17.9% (5)	--	--
2nd Exam	≤3yrs	100% (30)	--	--	--	--	100% (5)	--	--	--	--
	4-6yrs	95.8% (23)	--	4.2% (1)	--	--	66.7% (22)	21.2% (7)	6.1% (2)	6.1% (2)	--
	≥7yrs	100% (18)	--	--	--	--	81.8% (27)	3.0% (1)	12.1% (4)	3.0% (1)	--
3rd Exam	≤3yrs	83.3% (5)	16.7% (1)	--	--	--	100% (2)	--	--		--
	4-6yrs	100% (3)	--	--	--	--	78.3% (18)	4.3% (1)	13.0% (3)	4.3% (1)	--
	≥7yrs	100% (2)	--	--	--	--	68.4% (13)	10.5% (2)	21.1% (4)		--

4.2.8.5 Question 10 (Toothbrushing Frequency)

Parents / caregivers in the HSE North-East (intervention group) and HSE South-East (control group) were asked about tooth brushing frequency in order to establish current parental knowledge on how regularly children's teeth should be brushed and to record changes in knowledge on this issue over time. The majority of parents /caregivers in both regions thought that children's teeth should be brushed twice a day or even more than twice a day (Table 4.104). A higher proportion of parents /caregivers in the HSE South-East (control group) thought that teeth should be brushed more than twice a day. However, the combined results for the two optional answers 'brushing twice/day' and 'brushing more than twice/day', demonstrated similar values in both regions at baseline with no actual recorded change in the proportion of selected answers between the three questionnaires.

Table 4.104: Question: 'How Often Each Day Should Children's Teeth Be Brushed?'

'How often each day should children's teeth be brushed?'											
		HSE North-East					**HSE South-East**				
		Once	Twice	>Twice	Never	Don't know	Once	Twice	>Twice	Never	Don't know
Baseline	≤3yrs	5.3% (2)	73.7% (28)	21.1% (8)	--	--	4.5% (1)	54.5% (12)	40.9% (9)	--	--
	4-6yrs	--	77.3% (17)	22.7% (5)	--	--	3.6% (2)	60.7% (34)	35.7% (20)	--	--
	≥7yrs	--	66.7% (4)	16.7% (1)	--	16.7% (1)	--	67.9% (19)	32.1% (9)	--	--
2nd Exam	≤3yrs	--	73.3% (22)	23.3% (7)	3.3% (1)	--	--	80.0% (4)	20.0% (1)	--	--
	4-6yrs	--	87.5% (21)	12.5% (3)	--	--	3.0% (1)	51.5% (17)	45.5% (15)	--	--
	≥7yrs	--	94.4% (17)	5.6% (1)	--	--	--	75.8% (25)	24.2% (8)	--	--
3rd Exam	≤3yrs	--	100% (6)	--	--	--	--	50.0% (1)	50.0% (1)	--	--
	4-6yrs	--	100% (3)	--	--	--	--	69.6% (16)	30.4% (7)	--	--
	≥7yrs	--	100% (2)	--	--	--	--	73.7% (14)	26.3% (5)	--	--

4.2.8.6 Question 11 (Amount of Toothpaste Used)

Current general recommendations on toothbrushing suggest only using a small, pea-sized amount of fluoride toothpaste from the age of two years (Forum on Fluoridation, 2002). This question investigated the level of familiarity with this recommendation. The present findings demonstrate (Table 4.105) that the majority of parents / caregivers of pre-school children with disabilities in both regions use a pea-sized amount of toothpaste. However, a noticeably larger number of parents / caregivers in the HSE South-East (control group) stated to use a larger amount of toothpaste than the recommended pea-sized amount of fluoride toothpaste, when

compared to their peers in the HSE North-East (intervention group). Furthermore, it became apparent that awareness of the recommended amount of toothpaste increased over time in HSE North-East (intervention group). Almost all parents / caregivers claimed to use a pea-sized amount of toothpaste at the second examination i.e. after one year of exposure to the dental health prevention programme, whereas the recorded answers remained at comparable levels in the HSE South-East (control group) over the same observation period.

Table 4.105: Question: Examination On The Amount Of Toothpaste Used

'These pictures show different amount of toothpaste on a brush. Which picture shows the amount of toothpaste your child uses?'												
		HSE North-East					**HSE South-East**					
		Not brushed	No t/paste	Pea-sized	Half brush	Full /Overfl. brush	Not brushed	No t/paste	Pea-sized	Half brush	Full /Overfl. brush
Baseline	≤3yrs	23.7% (9)	23.7% (9)	44.7% (17)	7.9% (3)	--	--	4.5% (1)	81.8% (18)	13.6% (4)	--
	4-6yrs	--	18.2% (4)	77.3% (17)	4.5% (1)	--	--	--	73.2% (41)	23.2% (13)	3.6% (2)
	≥7yrs	--	16.7% (1)	66.7% (4)	16.7% (1)	--	3.6% (1)	--	64.3% (18)	25.0% (7)	7.2% (2)
2nd Exam	≤3yrs	--	26.7% (8)	73.3% (22)	--	--	--	20.0% (1)	60.0% (3)	20.0% (1)	--
	4-6yrs	--	--	95.8% (23)	4.2% (1)	--	--	3.0% (1)	75.8% (25)	6.1% (2)	15.2% (5)
	≥7yrs	--	--	100% (18)	--	--	--	--	87.9% (29)	6.1% (2)	6.0% (3)
3rd Exam	≤3yrs	16.7% (1)	33.3% (2)	50.0% (3)	--	--	--	--	100% (2)	--	--
	4-6yrs	--	--	100% (3)	--	--	--	4.3% (1)	82.6% (19)	4.3% (1)	8.7% (2)
	≥7yrs	--	--	100% (2)	--	--	--	--	89.5% (17)	10.5% (2)	--

As mentioned earlier, current general recommendations on fluoride toothpaste use advise parents / caregivers not to use toothpaste when brushing their children's teeth before the age of two years (Forum on Fluoridation, 2002). Prior to this age parents / caregivers are advised to brush their children's teeth with a toothbrush and tap water. For that reason it is interesting to stratify the answers according to the child's age: children aged two years or younger ('≤2-years') and children older than two years of age ('>2-years'). From Table 4.106 it can be seen that at baseline in the HSE North-East (intervention group) a larger proportion of parents / caregivers of children aged two years or younger ('≤2-years') claimed not to use any toothpaste, when compared to the HSE South-East (control group). Furthermore, this proportion increased in year two. An examination of baseline data collected in the HSE South-East (control group) revealed that the majority of

parents / caregivers claimed to use a pea-sized amount or half a brush of fluoride toothpaste.

Table 4.106: Question: Age Breakdown On Amount Of Toothpaste Used

		HSE North-East					HSE South-East				
		Not brushed	No t/paste	Pea-sized	Half brush	Full /Overfl. brush	Not brushed	No t/paste	Pea-sized	Half brush	Full /Overfl. brush
Baseline	≤2yrs	28.1% (9)	28.1% (9)	40.6% (13)	--	--	--	9.1% (1)	72.7% (8)	18.2% (2)	--
	>2yrs	--	14.7% (5)	73.5% (25)	11.8% (4)	--	1.1% (1)	--	72.6% (69)	22.1% (21)	4.3% (4)
2nd Exam	≤2yrs	--	42.1% (8)	57.9% (11)	--	--	--	--	--	100% (1)	--
	>2yrs	--	--	98.1% (52)	1.9% (1)	--	--	2.9% (2)	81.4% (57)	5.7% (4)	10.0% (7)

4.2.8.7 Question 11A (Preparation of Toothpaste Used)

In this context, parents / caregivers were asked to indicate what kind of toothpaste they give to their child (Table 4.107). It became apparent that a considerable number of parents / caregivers in both regions selected 'child toothpaste', which commonly refers to toothpastes with a reduced amount of fluoride (approximately 500 parts per million fluoride). However, preparations labelled as 'child toothpaste' with a higher amount of fluoride are available on the Irish market as well. That a considerable number of parents / caregivers in both regions selected 'child toothpaste' is an important finding as it documents the exposure of pre-school children with disability potentially to low levels of fluoride from an early age.

Table 4.107: Question: Consumption Of Different Toothpaste Preparations

		HSE North-East				HSE South-East			
		Family fluoride	Child fluoride	Non fluoride	Don't know/ Other	Family fluoride	Child fluoride	Non fluoride	Don't know/ Other
Baseline	≤2yrs	6.3% (2)	15.6% (5)	12.5% (4)	65.6% (21)	18.2% (2)	36.4% (4)	18.2% (2)	27.3% (3)
	>2yrs	26.5% (9)	58.8% (20)	--	14.7% (5)	28.4% (27)	66.3% (63)	4.2% (4)	1.1% (1)
2nd Exam	≤2yrs	26.3% (5)	26.3% (5)	5.3% (1)	42.1% (8)	--	100% (1)	--	--
	>2yrs	69.8% (37)	28.3% (15)	--	1.9% (1)	37.7% (26)	55.7% (39)	4.3% (3)	2.9% (2)

4.2.8.8 Question 12 (Parental Support When Toothbrushing)

This question investigated if pre-school children with disabilities get any support when brushing their teeth and therefore is a proxy measure of dental health behaviour of parents / caregivers and reflects on their attitude towards oral care as well. The findings (Table 4.108) indicate that the majority of parents / caregivers were aware of their children's need for support and provided them with assistance.

Furthermore, the findings demonstrated a trend towards child self-care in the older age groups. It appeared that more children in the HSE South-East (control group) brush their teeth themselves when compared to the HSE North-East (intervention group).

Table 4.108: Question: Examination Of Parental Toothbrushing Support

'Does anyone help your child to brush his / her teeth?'							
		HSE North-East			**HSE South-East**		
		Child	Mother/ Father	Others	Child	Mother/ Father	Others
Baseline	≤3yrs	0.0% (0)	68.4% (26)	31.6% (12)	9.1% (2)	90.9& (20)	0.0% (0)
	4-6yrs	4.5% (1)	90.9% (20)	4.5% (1)	16.1% (9)	80.4% (45)	3.5% (2)
	≥7yrs	16.7% (1)	83.3% (5)	0.0% (0)	28.6% (8)	64.3% (18)	7.1% (2)
2nd Exam	≤3yrs	3.3% (1)	93.3% (28)	3.3% (1)	0.0% (0)	100% (5)	0.0% (0)
	4-6yrs	8.3% (2)	91.7% (22)	0.0% (0)	21.2% (7)	78.8% (26)	0.0% (0)
	≥7yrs	11.1% (2)	88.9% (16)	0.0% (0)	30.3% (10)	69.7% (23)	0.0% (0)
3rd Exam	≤3yrs	0.0% (0)	83.3% (5)	16.7% (1)	0.0% (0)	100% (2)	0.0% (0)
	4-6yrs	0.0% (0)	100% (3)	0.0% (0)	8.7% (2)	91.3% (21)	0.0% (0)
	≥7yrs	0.0% (0)	100% (2)	0.0% (0)	10.5% (2)	89.5% (17)	0.0% (0)

4.2.8.9 Question 14 (Self-rated Toothbrushing Skills)

This question investigated parental self-rating of their ability to carry out and finish dental health related tasks. Furthermore, this question documented changes in parental dental health related skills over time. The findings demonstrated (Table 4.109) that parents / caregivers in the HSE South-East (control group) rated their ability to carry out dental health related tasks higher than their peers in the HSE North-East (intervention group). Furthermore, these self-reported confidence levels were largely unchanged in both regions over the observation period.

Table 4.109: Question: Parental Self-rated Confident To Carry Out Dental health Related Tasks

'Cleaning my child's teeth is a task that I feel confident to carry out'											
		HSE North-East					**HSE South-East**				
		Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Baseline	≤3yrs	44.7% (17)	31.6% (12)	21.1% (8)	2.6% (1)	--	31.8% (7)	68.2% (15)	--	--	--
	4-6yrs	40.9% (9)	36.4% (8)	22.7% (5)	--	--	42.9% (24)	57.1% (32)	--	--	--
	≥7yrs	50.0% (3)	33.3% (2)	16.7% (1)	--	--	42.9% (12)	53.6% (2)	--	3.6% (1)	--
2nd Exam	≤3yrs	36.7% (11)	53.3% (16)	10.0% (3)	--	--	40.0% (2)	60.0% (3)	--	--	--
	4-6yrs	33.3% (8)	54.2% (13)	8.3% (2)	4.2% (1)	--	33.3% (11)	60.6% (20)	--	6.1% (2)	--
	≥7yrs	38.9% (7)	55.6% (10)	5.6% (1)	--	--	45.5% (15)	51.5% (17)	--	2.8% (1)	--
3rd Exam	≤3yrs	50.0% (3)	33.3% (2)	16.7% (1)	--	--	50.0% (1)	50.0% (1)	--	--	--
	4-6yrs	33.3% (1)	33.3% (1)	--	33.3% (1)	--	52.2% (12)	39.1% (9)	4.3% (1)	4.3% (1)	--
	≥7yrs	50.0% (1)	50.0% (1)	--	--	--	47.4% (9)	52.6% (10)	--	--	--

4.2.8.10 Question 15 (Self-rated Toothbrushing Skills)

This question investigated how parents / caregivers rated the quality of their dental health related skills with regards to brushing their childs' teeth. The findings demonstrated (Table 4.110) similar trends in parental self-rated quality of their skills in the two regions. The majority of parents / caregivers 'strongly agreed' or 'agreed' the statement provided. Furthermore, recorded levels of agreement with the provided statement were largely unchanged in both regions over the observation period.

Table 4.110: Question: Parental Self-rated Quality Of Tooth Brushing

		'When I brush my child's teeth, I think I do it well'									
		HSE North-East					**HSE South-East**				
		Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Baseline	≤3yrs	26.3% (10)	42.1% (16)	31.6% (12)	--	--	22.7% (5)	59.1% (13)	9.1% (2)	9.1% (2)	--
	4-6yrs	13.6% (3)	36.4% (8)	36.4% (8)	13.6% (3)		26.8% (15)	64.3% (36)	3.6% (2)	5.4% (3)	--
	≥7yrs	33.3% (2)	50.0% (3)	12.1% (1)	--	--	21.4% (6)	75.0% (21)	3.6% (1)	--	--
2nd Exam	≤3yrs	33.3% (10)	56.7% (17)	10.0% (3)	--	--	20.0% (1)	60.0% (3)	20.0% (1)	--	--
	4-6yrs	25.0% (6)	45.8% (11)	25.0% (6)	4.2% (1)	--	21.2% (7)	69.7% (23)	3.0% (1)	3.0% (1)	3.0% (1)
	≥7yrs	22.2% (4)	66.7% (12)	11.1% (2)	--	--	30.3% (10)	57.6% (19)	3.0% (1)	9.1% (3)	--
3rd Exam	≤3yrs	33.3% (2)	33.3% (2)	33.3% (2)	--	--	--	100% (2)	--	--	--
	4-6yrs	--	66.7% (2)	--	33.3% (1)	--	34.8% (8)	56.5% (13)	8.7% (2)	--	--
	≥7yrs	--	100% (2)	--	--	--	21.1% (4)	68.4% (13)	10.5% (2)	--	--

4.2.9 Referrals and Provided Treatment

An integral part of the oral disease prevention programme in the HSE North-East was the provision of dental health education and/or preventive treatment depending on the outcome of a comprehensive assessment, which was part of the clinical examination. The present section summaries the outcomes of the baseline referrals for dental health education and/or preventive treatment.

4.2.9.1 Referrals Stratified by Age

Approximately 158 children of the 196 children examined at baseline in the HSE North-East required a referral for additional dental health education and/or preventive treatment. Table 4.111 gives an overview on the age distribution of those children who required a referral. In four children was the collected age related data ambiguous or incomplete and for that reason excluded from Table 4.111. The age distribution demonstrates that predominantly younger children were referral for additional dental health education and/or preventive treatment.

Table 4.111: Baseline Distribution Of Referrals In The HSE North-East Stratified By Age

	All children		2nd Examination Attendees	
Age	**Frequency**	**Percent**	**Frequency**	**Percent**
1	38	24.7	20	28.2
2	19	12.3	10	14.1
3	28	18.2	11	15.5
4	29	18.8	17	23.9
5	24	15.6	12	16.9
6	13	8.4	1	1.4
7	1	0.6	--	--
8	1	0.6	--	--
9	1	0.6	--	--
Total	154	100.0	71	100.0

Furthermore, Table 4.111 highlights that the composition of children at baseline who participated in the second examination was very similar when compared with the total baseline sample.

4.2.9.2 Referrals Stratified by Disability

A breakdown in disability groups demonstrates that the majority of children fall in the group of children with a cognitive disability (Table 4.112). The composition of children who participated in the second examination appears to be similar to that of the whole group of children examined at baseline. However, the number of children whose diagnosis still has to be established is lower in the group of who participated in the second examination when compared with all children examined at baseline.

Table 4.112: Baseline Distribution Of Referrals In The HSE North-East Stratified By Disability

	All children		2nd Examination Attendees	
Disability	**Frequency**	**Percent**	**Frequency**	**Percent**
Cognitive	101	63.9	48	67.6
Physical	15	9.5	5	7.0
Cognitive & Medically	29	18.4	15	21.1
Medically Compromised	3	1.9	2	2.8
Not Diagnosed	10	6.3	1	1.4
Total	158	100.0	71	100.0

4.2.9.3 Referrals Stratified by Dental Caries Risk Level

Part of the referral process was a comprehensive dental caries risk assessment in order to determine the level of quality and urgency of referral (see Table 3.1, page 65 for risk assessment criteria). Table 4.113 demonstrates that the medical history in the majority of children was considered a low risk whereas the fluoride toothpaste status revealed a medium and high risk in the majority of children i.e. the use of fluoride containing products may not be sufficient and appropriate and the present dietary habits of pre-school children with disabilities appeared to be considered of high and medium risk in the majority of children.

Table 4.113: Baseline Results Of Risk Assessment In The HSE North-East

Risk level		**Diagnosis**	**Medical history**	**Dietary history**	**Fluoride status**	**Clinical examination**
High	N	71	17	84	59	23
	%	44.3	11.5	57.5	40.4	16.0
Medium	N	48	22	36	74	14
	%	32.7	15.0	24.7	50.7	9.7
Low	N	28	108	26	13	107
	%	19.0	73.5	17.8	8.9	74.3
Total	N	147	147	146	146	144
	%	100.0	100.0	100.0	100.0	100.0

In addition, the risk assessment underpins the previously elaborated findings of the clinical examination which demonstrated an overall low level of oral disease and subsequently at present a low risk for the development of such diseases.

4.2.9.4 Referrals to Oral Care Providers and Need for Urgent Treatment

In order to provide a patient-centred oral health care service for pre-school children with disabilities, it is important to have good insight into the required preventive treatment and who is the most appropriate provider of this treatment. The referral forms collected information on which oral health care provider the clinicians referred patients for further treatment after the clinical examination. Clinicians were allowed to select more than one oral care provider and could prioritise the treatment as urgent. Table 4.114 clearly demonstrates that the majority of referrals went to the oral health promotion (OHP) team i.e. clinicians concluded after a standardised assessment that the majority of patients would benefit most from services provided by the OHP team (i.e. oral health education and diet counselling for parents / caregivers) in order to improve the child's' oral health.

Table 4.114: Baseline Distribution Of Referrals By Oral Care Providers In The HSE North-East

Need for Referral...		Referral to hygienist	Referral to OHP team	Immediate treatment needed
'Yes'	N	59	141	17
	%	39.1	93.4	11.3
'No'	N	92	10	134
	%	60.9	6.6	88.7
Total	N	151	151	151
	%	100.0	100.0	100.0

However, more than half of all assessed children were considered to benefit from treatment provided by dental hygienists as well (such as plaque and calculus removal). As section 4.2.5 of this report (oral hygiene assessment) already demonstrated, the majority of children required oral hygiene instruction and/or some form of periodontal health related treatment with an elevated need for such treatments in children older than three years of age.

4.3 Qualitative Research

As the present study investigated the dental health levels of a section of the population which had not been researched previously, qualitative research has been used along with quantitative methods in order to interpret and better understand the complex reality of dental health status and the implications of the quantitative data. The key difference between quantitative and qualitative methods is their flexibility. With quantitative methods such as surveys and questionnaires, all participants were asked identical questions in the same order. The response categories from which participants may choose are 'closed-ended' or fixed. Qualitative methods are more flexible, i.e. they allow greater spontaneity and adaptation of the interaction between researcher and the study participant. This has obvious advantages in the present exploratory research as participants are free to respond in their own words and the direction in which answers went was not foreseeable. Furthermore, with qualitative methods, the relationship between the researcher and the participant is often less formal than in quantitative research. Participants have the opportunity to respond more elaborately and in greater detail than is typically the case with quantitative methods. In turn, researchers have the opportunity to respond immediately to what participants say by tailoring subsequent questions to information the participant has provided (Mack et al., 2005).

4.3.1 Coping Strategies of Caregivers of Children with Disabilities

Addressing oral health using a whole person approach, i.e. aiming to reduce the need for treatment by using health promotion rather than education, and including parents / caregivers in decisions and choices about the oral health needs of their children appears to be a proactive way of reducing need for treatment. There are several types of providing and enabling such needed support that enhances coping with the specific demands of caring for a child with disabilities, including social support. Social support has continuously been implicated in the reduction of stress and isolation (Campbell et al., 2004), increasing levels of coping, adjustment and self esteem (Baker et al., 2009), as well as skill acquisition (Law et al., 2001; Davies and Hall, 2005). For that reason the present study used focus groups to facilitate an exploration of current coping strategies of parents / caregivers of children with disabilities employed in order to develop a purposeful social support environment.

4.3.1.1 Sample

One hundred and fourteen parents / caregivers of children with disabilities from the HSE South-East with full contact details were on the database on the cut-off date 31.04.2009 for the qualitative research. All parents / caregivers were contacted by letter asking if they wished to participate in this part of the study (Appendix H). Eight parents / caregivers responded initially, then another four. Focus groups were arranged at a mutually agreeable time and date for the parents and consent forms were signed on the basis of parents having understood the information sheets (Appendix I). The parents / caregivers were all mothers; no fathers chose to participate in the focus groups. All mothers were from a wide range of age, educational, and socio-economic backgrounds. The volunteers were randomly arranged in three focus groups which all took place in a seminar room in the HSE primary care centre in Kilkenny, on the same day. Each focus group lasted between one and two hours and was dependent on the interactions between parents / caregivers. The parents / caregivers were all the same gender (i.e. mothers) and of the same cultural background. Socio-economic status differed from parent to parent; this became apparent in the first focus group, because the parent with the higher socio-economic status led the group. The second group flowed easily and there were no hesitations or pauses. This group obviously felt comfortable together, and the group dynamics worked well; there was little evidence of power differentials and this could be directly related to intrapersonal characteristics, the age mix, and the evident non-verbal cues that passed between the parents / caregivers and the moderators. This group exhibited cohesiveness; or the extent to which they were attracted to one another and accepted and agreed the priorities and the goals of the group (Pennington, 2002).

4.3.1.2 Data Analysis

The data analysis identified several themes (Table 4.115), which fitted within the three broad domains of coping:

- individual (psychological) coping
- collective coping
- problem focused coping

The results are reported corresponding to each of the three domains as well as selected quotes that emphasise the themes. Whilst each domain is seen as 'fixed', the themes may cross over between domains as contexts differ. Metaphors were

also identified in which mothers highlighted the emotive significance of their narratives, and indeed the context in how they experienced their daily lives. Social barriers were also identified and then related to the three domains of coping. It is acknowledged that because of the discrete nature of some of these themes they may move between one another depending on the context.

Table 4.115: Overview of themes within the three domains of coping

Domain	Coping		
	Individual	**Collective**	**Problem Focused**
Theme	1. Isolation	1. Community	1. Planning
	2. Mothering	2. Social Debriefing	2. Information
	3. Expectations	3. Institutions	3. Finances
	4. Comparison		4.Negotiating Services
	5. Partner Support		

4.3.1.2.1 Domain Analysis: Individual Coping

Individual coping is linked very strongly with problem-focused coping but involves higher level cognitive strategies as individuals reflect and reappraise their perceptions of a situation.

1. Theme: Isolation

Isolation is usually viewed in negative terms as the individual retreats and isolates them. However, for parents of children with disabilities isolation becomes a way of coping as parents adjust their expectations of parenthood.

Mother A	*"You just want to get under the blanket and hide, but you have to be in control and hold it all together even though you are unsure of what it is you are actually doing. You learn so much from doing for yourself"*
Mother B	*"When you are left alone and unsupported you either sink or swim and I developed a head like a pickaxe. I got stronger and did things I would never have dreamt of doing before I had Aiden; I started asking and I kept asking until I got what I wanted for him. You learn a lot in a short space of time and you become nurses overnight."*
Mother C	*"You need time to grieve for the child you expected to have before you can move forward. I felt like I was going to a funeral after my child was born because I wanted a perfect child; no-one wants to be the owner of a handicapped child. When my child was born I didn't want anyone around me, then I realised that all children were different and that anything I needed I would have to do myself because my child couldn't ask, and I couldn't wait for people to come to me."*

These three mothers developed resilience through isolation; just being left alone and given time to gather their thoughts gave them the strength to challenge normative societal notions of children and parenting.

2. Theme: Mothering

There is a wealth of research written about parenting and especially mothering and how the way that society talks about mothering can create expectations about what it means to be the ideal mother or having the 'perfect' baby (Phoenix et al.,

1991). The 'good enough mother' is usually viewed in a negative light, but mothers participating in the focus groups used this vision of mothering as a way of reinforcing their coping skills.

Mother D	*"It's harder for men. A mother is a mother; my children are my life. I gave up my job to look after them."*
Mother E	*"I sat and said why me? Then I thought this is as easy as you make it in your head; it was easy whilst he was in the womb because he was normal there like you know? Then I realised it was my son, my responsibility, I had to do things for him."*
Mother F	*"I realised that every stage is different, I was her mum and those stages meant so much, even though it was my job there were times when I was in tears because I was so tired."*

Motherhood is seen in terms of the joys, frustrations, and levels of tiredness that comes with any job. Cognitive appraisal of motherhood as a 'job' appears to be one way that mothers develop resilience. However, this does not prevent mothers from internalising the more negative associations with motherhood.

Mother G	*"I felt guilty when she was diagnosed that I'd done something wrong."*

Issues of feeling 'responsible' and 'guilty' frequently arose during the discussions, and it was observed that other mother's positive responses helped to 'normalise' these feelings.

3. Theme: Expectations

Expectations were frequently mentioned throughout the focus groups.

Mother H	*"You know there's less expectations from older mums when you have a disabled child than for younger mums. Older mums don't expect things to be as perfect, you've been around longer and seen more."*
Mother F	*"Acceptance is quicker with a later child than with a 1st child with disabilities, they just have to fit in with everyone else."*
Mother D	*"...you don't expect as much from a child if they have Downs..."*

Not expecting as much or expecting a child to 'fit' in with the family, and having life experience appeared to be one way of mothers developing resilience. A holistic view of their child was taken as a part of the family, not a separate individual.

Mother I	*"The midwife looked shocked and I knew there was something wrong by the expression on her face, they talked together and kept away from me. I was treated differently and left on my own to worry and that's worse thinking that there might be problems but not knowing what they were."*
Mother G	*"I found out by reading my child's notes upside down that he had hydrocephalus, and then I asked questions but they were quite secretive before I asked."*
Mother J	*"The doctor's attitudes frighten some mothers; they can be negative and leave your concerns unaddressed. It's as if they don't trust you and you're the mammy."*
Mother B	*"One doctor said to us 'you do realise he's more likely to suffer a cot death' as we were ready to leave the hospital. We then ran around sourcing a sleep apnoea monitor so that we could sleep easy. Everything is down to you."*

Mother C	*"It can be really difficult at school with children taunting him. I just think it's children being children because they can't put themselves in the other child's position, but you still have to sort it out for them when they get home. You want to protect them but they have to learn to live in the world and it can be so hard hearing how upset they can get. He's friends with the same children now but he had to learn to say stop because he can't run away being in his chair."*
Mother F	*"You know it can be other families who can isolate mums with children with disabilities, and there's the kind of patronising approval that you get from other people who make judgements about you, your children, and your family."*

Professional attitudes and expectations of how a parent should receive information, and indeed what information they should receive, coupled with professional and societal attitudes towards parents indicated that barriers to resilience were rooted in the practices of others.

4. Theme: Comparison

Comparison with other parents and children enhanced mother's ability to develop resilience. The tensions in some of the accounts were apparent and derived from visible differences and societal definitions of normality.

Mother H	*"Children with Down's syndrome look different but if your child has autism they look normal and that's an advantage when you are out, you don't look different to other mums...people don't look as much."*
Mother G	*"You know, having a disability is enough to carry. If you can fix things like the teeth you do because a lot cannot be fixed, but if children look the same as other children…not have things that make them look different like bad teeth, then that's good."*
Mother E	*"Whilst I was carrying him he was normal, I was a normal mum. Nobody wants a child with problems, looking different is not easy, you just want to fit in, but sometimes it's difficult knowing where you fit in; like there's Downs and autism groups but if you don't fit in because your child is different……."*
Mother C	*"My child is only in a wheelchair, he has spina bifida and things aren't nearly so bad for me you know. I mean my child talks, can feed himself and we just get on with it, we don't have things as badly as some other mums."*

Fitting in and conforming were also issue to do with comparing children and comparing their situation to other parents and children, which in turn reinforced resilience. However, there was a tension between 'fitting' in and feeling that your child looked the same as other children, fixing things that could be fixed, and accepting that there were other parents who struggled far more and that you coped relatively easily compared to others.

5. Theme: Partner Support

Support from partners, friends, and more importantly other parents of children with disabilities assured mums that they were not experiencing things alone, but a strong marital relationship was not always an important contributor to a mothers' coping strategies.

Mother C	*"We broke up a year ago and since we broke up the things he does with the child are unbelievable. Before he did nothing, apart from when he had to, now he changes him, dresses him, takes him out. But he couldn't do it to help me out when I needed it. You know we never spent time together, I was always doing everything, and things went downhill rapidly. Looking back, if I had some help maybe we wouldn't have split up, but I just felt I had to do everything. I suppose I was a bit of a martyr. Now at least I get a weekend to myself and I can go out and do things that I never managed to do before. I'm probably better off on my own in terms of support."*
Mother H	*"My husband's family is so supportive, they help me and I have time to learn to do everything I have to do."*
Mother B	*"My friend was so supportive, she looked into all my entitlements, I just didn't have time and it was through her I discovered I was entitled to home support; she told me how to apply."*
Mother E	*"My partner and I split up as well. I don't want to say it was because we had a child with disabilities but it was stressful and we get on great now we are apart. You know, he spends more time with his dad and I can even have a holiday and know there is someone to look after him, it is better in so many ways. I just know when I am going to get a break and if I need to go somewhere suddenly his dad looks after him."*
Mother I	*"My husband is great, when I feel I cannot cope he just takes over, sends me off somewhere like a friend's house to have a cup of tea or a drink and a chat. His family are close and that helps because there's always someone around to give a hand if I need it. Things would probably be more difficult if we didn't have that support."*
Mother J	*"I get home support from the health board which is great but my carer is not insured to take my child out. So if she wants to take him somewhere I have to take him in the car, meet her there and then return to pick him up…how is that supporting me…how does that give me some time to myself?"*

Participating mothers expressed that they need time to themselves and practical support that enabled them to cope with looking after their children. However, positive bonds between parents; whether living together or apart, were also an enabling factor in developing resilience. Barriers to support came from services that were unable adjust support to individual needs.

4.3.1.2.2 Domain Analysis: Collective Coping

Collective coping is strongly linked to individual and problem solving coping, but involves the function of a group, or community, or service to enable the development of resilience. Previous research on collective coping identified that people turn to others following a cognitive upheaval and associated refection, followed by talking, and then adaptation (Pennebaker and Harber, 1993). Kerr and McIntosh (2000) demonstrated that talking to similar others, or those who were perceived to have undergone corresponding circumstances, was perceived as beneficial.

1. Theme: Community

A sense of belonging was regarded as important for some mothers in developing resilience, and taking part community activities reduced their sense of isolation and increased their ability to cope. Acknowledging that other parents experienced similar issues enabled them to feel less stressed and more supported.

Mother C	*"It's important that you get put into the community so that you are not isolated."*
Mother D	*"You learn from talking to other parents that you still struggle with money, fitting everything in, schooling, and work, whatever. Even if you don't have a child with disabilities it's still hard being a parent there's so many expectations on you to do well for your child. People think I'm badly off but I don't think that way."*
Mother I	*"It's important that children with disabilities are integrated into the community. Only you can do that because if they are at a special school during the day they are not mixing with kids without disabilities. Just getting out there makes people accept you more because you are nothing different, and they accept your kid because they are used to seeing them around. Now the number of people that stop and talk to us when we are out feels grand."*

These mothers were quite positive about their children and being accepted into their communities. They saw community as a means of social support and a way of reducing isolation and increasing acceptance. The other mothers in the groups did not challenge these perceptions, but because of the diversity of mothers it can not be taken for granted that all mothers would feel the same.

2. Theme: Social Debriefing

A place to meet other parents appeared to be extremely important for the participating mothers. All three focus groups discussed the benefits of meeting other parents.

Mother C	*"I learnt by talking to other parents and mothers, it was like a little support ecosystem. It was too early to do after the birth of my child but later I found it so much help. I learnt so much."*
Mother H	*"It would be great to be able to learn more about what you were entitled to, or what you had to do without having to get involved with support groups, just meeting sometimes helps you redefine what you think is normal,….I mean you feel more normal you know when you meet other parents."*
Mother J	*"There's the strength of being together in a group, there's always the problem of some people being more vocal than others, but you learn from other people's experiences."*
Mother F	*"Parents supporting each other learn so much from each other. When I went to groups even being able to talk to someone who understood what it was like to have a child with a disability; I could say things like 'I could have killed her' and didn't get the stare and the look that says 'how can you talk about your own child like that', or even the comments, I just felt normal."*

Mother I	*"It's sometimes difficult to spare time to be with other parents and some support groups have trouble keeping going because no-one wants to run them. There's established groups like Down's and Autism but if you don't fit those labels where do you go? Sometimes you just want to talk about things like services and see if anyone has any answers, sometimes it helps if you get a professional in to talk about things you are interested in and then give you more information to follow up, there's all sorts of things that you get out of being with other parents. What isn't any fun is having to get involved with committees, or having to do fund-raising because you just don't have the time or energy. Drop-in sessions are more helpful, and then you just choose."*
Mother B	*"Parents can form their own groups but then there's the difficulty of keeping them going, there's a lot of apathy around and attendance is an issue. But some people don't help themselves. We came to talk about groups and what we thought of them but if you are talking about teeth then they are not a priority all the time, there's bigger things that we have problems with, like loads of medical appointments, medical cards, domiciliary care allowance, disability badges for parking, and the fact that everything is geared towards the private sector and if you can't pay you don't get."*
Mother D	*"Helping each other is important; it helps to know that you're not alone. If there was some national booklet for parents that said where you could meet in each area for a chat and a drink, or a list of things that we might find useful like talks about health, or benefits, or schooling; practical things that would make our lives easier. We need some sort of communication network that's open to every mum, not just those with children with Down's or autism."*

The advantage of meeting other parents became apparent and appeared to be a forum where a large amount of information is transmitted and exchanged. Parents made clear that they want to meet informally without the pressures of a formal group and the administrative structures that it can sometimes entail.

3. Theme: Institutions

Health promotion has been defined by the World Health Organization's 2005 Bangkok Charter for Health Promotion in a Globalized World as "the process of enabling people to increase control over their health and its determinants, and thereby improve their health" (WHO, 2005). The constructs of caring, holism and ecology would appear to be an essential issue in developing sustainable strategies for health promotion. Part of sustainable health promotion sits within developing the skills of individuals and the community. Therefore part of effective coping concerning oral health would be to develop mechanisms that enable parents to take control of the situation themselves and make choices and decisions about their child's oral and general health. The results of the focus groups made transparent that parents' experience with institutions in the area of health care are complex and multilayered.

Mother H	*"One section may be talking about problems that they have about providing services for mums with disabilities and not realise they would have repercussions for other services; they just don't talk to one another."*
Mother C	*"There are different levels of services within and between counties and a lack of integration. Enable Ireland is only partially funded in some areas and not at all in others so you have no integration between dental and mainstream services. You are made to feel grateful for any services and grateful for what you can get."*
Mother E	*"We need parent based services, every child has needs, and we need special needs co-ordination in every area. It's the squeaky wheel that gets the oil and the more we talk about things, or shout, the more likely we are to get things done. Just things like at pre-natal clinics they could start talking about the possibility of having a child with disabilities and then what you need to do if that happens to you. There's a lack of effort by services. We need to be prepared, we need to know what to do, we need to choose what suits us not be told what we need, we need to be treated as individuals not as a group."*

Services at present were described as struggling with meeting the needs of the population, but the participating mothers were asking for the right to choose what they use or do not use. They were asking for the right to be treated as individuals. Services could enable resilience by taking on board some of the issues that mothers felt would enable them to cope on a daily basis.

4.3.1.2.3 Domain Analysis: Problem Focused Coping

Problem focused coping enables individuals to develop resilience by solving a problem that causes distress. It may include the development of skills, planning and resolving conflict, it also involves the efforts directed at acquiring resources to help deal with the underlying problem, and in effect it is very task oriented and has a direct link with individual coping (Lazarus and Folkman, 1984). This type of coping is also influenced by the controllability of the situation (Folkman and Moskowitz, 2000).

1. Theme: Planning

Being able to plan enabled participating mothers to have some semblance of control over their daily lives and it also assisted them with adapting to unexpected situations.

Mother J	*"Nobody thinks about the pressure of everyday living like it can take 40 minutes to just put on a T shirt, then there's housework and everything else that most people take for granted. The other two are at school so we are in a routine; up, dressed, they get the bus and I'm left to sort Ciaran out. But the medical appointments that we have are now 3 months apart, so it means we can plan more things in between times."*
Mother H	*"Not knowing what your child has, I mean not having a diagnosis means we cannot plan for our future, it's like we are in limbo."*
Mother J	*"You know the pain of assessment once you get the diagnosis and services are recommended, but you're no better off you know because the services aren't available, so it's a waste of time and money, and you still can't plan nothing."*

It became clear that having an assessment that gave mothers a clear diagnosis and almost what to expect coupled with being able to access services that suited them. This helped mothers to feel more in control of their daily lives.

Mother G	*"There's no guidelines with anything, like how to get a medical card, and what people don't think is that everything's turned upside down when you have a child with extra needs. It wasn't until I questioned the liaison nurse did support occur, like there was no follow up from the hospitals and I didn't know any different, I went on in a fog. When small things happen that help it's one less thing for you to sort out, if I had known from the beginning what to do, what I was entitled to things would have been easier; I could have done more, planned my day better, thought about our future as a family instead of the twenty four and a half hours in every day."*

The public health nurse appears to act as a gatekeeper to services, which was echoed by other mothers. Mothers were either lucky and had a public health nurse whose knowledge of services and entitlements enabled them to organise their daily lives, or you were in an area which lacked public health nurses and had to struggle through on a daily basis. Time, or the lack of it, belongs within planning because it plays a large part in mother's every day lives and all mothers talked about their lack of time in every focus group without prompting.

Mother B	*"I get 4 hours a week of home support, it's a tutor entitlement to help Liam when he starts school, and I get other home support but even with the help it's also difficult to spare any time to do anything else."*
Mother D	*"I've no time for myself and I'm so dependent on my family, I really don't feel I can ask them to do more."*
Mother C	*"There's not enough time in the day; I've no social life, my child's routine comes first, I sometimes feel like my life is ruined."*
Mother I	*"There's a pressure on you keeping appointments; are they well? Are their teeth ok? Are they eating? And then there's your own life as well…it's all difficult."*

All participating mothers made clear that they loved their children unreservedly, but, like all busy parents with children, indicated that more time would enable them to bounce back recharged.

2. Theme: Information

Information related to development and aspects of care have been cited as of value by parents, alongside continuity of care (Miller et al., 2009). It may well be that relevant and timely information helps parents to retain a sense of control and promote resilience.

Mother H	*"Each child is different but the information that we get treats all children as being the same, so children get treated as a group, not individuals and that's no help when you are a parent."*
Mother I	*"Sometimes there's no staff continuity and you end up telling the same story to yet another stranger, so there's no co-ordination and services are not joined up. If you could have all your appointments on one day that would help."*
Mother F	*"Information is just so important, you spend a lot of time on the internet but sometimes the information is not up-to-date, or the addresses and phone numbers have changed, you have to take initiative yourself and its all time."*
Mother E	*"There should be one main person who you are in contact with who knows what your child needs and then they talk to everyone else and arrange things. The lack of staff is a problem because you see different people all the time, there's no liaison nurse for this area so you are on your own. Carers leave after a few years and you are back to running round trying to find things out again."*
Mother B	*"You can get information overload, like when you first have the child and everyone is giving you loads of information, you just want to find some of it out in your own time and when you can cope with knowing what might be."*
Mother C	*"There are no guidelines for you to follow, no follow up from hospitals. Sometimes you get a documentary on the television and you get information that you didn't have and that helps, you learn a lot this way, and the more you know the more you can help yourself."*
Mother J	*"You know, you get a lot of information from parents that you don't find in the leaflets and the booklets, stuff that really helps; people should write it all down so you don't just happen to be lucky when someone tells you."*

These parents are all talking about the availability of information that enables them maintain a locus of control over their every day lives. Moreover, the availability of information appears to emerge from outside the recognised networks of the medical profession, and as parents indicate is often outdated and inaccurate.

3. Theme: Finances

Financial well being has often been reported as being of importance for families of children with disabilities (Emerson and Hatton, 2007; Dowling and Dolan, 2001; Dobson et al., 2001) in order to exert greater control over their daily lives.

Mother D	"There's a lack of knowledge about entitlements, we need one main place where we can go and get information."
Mother C	"I had to give up my job to look after my child: I had no choice. Then I split up with my partner and I'm better off more money, time, everything."
Mother E	"When you have a child your life changes but when you have a child with disabilities your lifestyle changes as well, a lot is not made public and you struggle with so many things and you get to a stage when you don't want anybody else around, not even the services. The cost of phone calls can be more than anybody can think, that's without everything else."

Lack of financial support can be a barrier to resilience, creating cumulative stress in parent's daily lives.

4. Theme: Negotiating Services

Participating mothers others indicated that successful negotiation of services made them feel in control.

Mother I	*"You either take the services on board or you don't, and there's a lot of energy put into early years because the sooner you get to something the more help you can give it early on, but after a certain age there's a reduction and then you have to fight because the needs don't go away."*
Mother H	*"Keeping appointments can be a nightmare and getting them can be even worse. You shout and shout, it's the squeaky wheel, and you feel like they won't take no notice, but it's massive when they do."*
Mother J	*"You've got the stigma of special schools and you seem to have every obstacle put in your way; you just get over one and there's another. I learnt not to run round trying to do everyone's job and work on the things that caused the biggest problem at the time. Like you can't expect teachers to start doing work that's not theirs, it puts them under pressure and you wouldn't expect a child minder to take your child to the physio…I work on what I can and get what I can."*

These parents have negotiated services successfully. Each successful encounter helped them to develop resilience. Mother's are also aware of role conflict with care and teaching staff which may moderate their expectations of services.

4.3.2 Non-Response / Non-Participation Analysis

In order to investigate barriers to participation in the present study, qualitative research methods were employed because they provide valuable insights into the perspectives of the study population and their difficulties in participating in the study. This approach produced culturally specific and contextually rich data, which may well prove critical in the design of comprehensive solutions to improve the oral health of young children with disabilities. Participants had the opportunity to respond elaborately and in greater detail.

4.3.2.1 Sample

All parents / caregivers of pre-school children with disabilities registered with Enable Ireland and whose names and contact details were forwarded by Enable Ireland to the HSE dental service in order to obtain consent for release to the research team, but who refused to give such consent were contacted in January 2009 by letter asking if they wished to participate in the non-response analysis of the present study (Appendix H). As no details on this group of parents / caregivers were available to the principle investigator, the level of participation is unclear. However, the HSE dental service was supplied with 100 pre-labelled and stamped

return envelops in order to reduce the administrative burden on the HSE dental service. Ten parents / caregivers responded initially, then another three. Individual interviews were arranged by the principal investigator and took place between 20. to 24. January 2009. One parent withdrew from participation as her child passed away between initial consent and scheduled interview. All interviews took between forty minutes and two hours depending on what the parent / caregiver wanted to discuss. Focus groups were declined by parents / caregivers due to childcare and time pressures coupled with the need for privacy. The majority of parents requested that the interviewer travel to them because this fitted in with their existing childcare and lifestyle arrangements. However, some parents / caregivers requested interviews in their local HSE primary care centre. These interviews took place in a seminar rooms in the HSE primary care centres in Waterford, Wexford and Kilkenny. All parents / caregivers signed a consent forms on the basis of parents having understood the information sheets (Appendix I). All parents / caregivers were from a wide range of age, educational, and socio-economic backgrounds. Some parents / caregivers had one child with disabilities; other parents had two or three children with disabilities.

4.3.2.2 Data Analysis

Summary of parent's experiences

All participating parents identified the demands on their resources as the main obstacle. Oral health care was generally a low priority for them and participation in an oral health care research project without immediate gain was out of the question because of these competing daily demands. Wrangling with health care services in order to obtain medical, child developmental and family support for their child was initially of greater concern than their child's oral health. Confidence appeared to be an issue, which may constrain parents from attendance, perhaps fears concerning devaluing of their personal experiences by other non-dental professionals.

It became apparent that a large burden of care is placed on mothers, although the parents interviewed appeared to have supportive partners and a supportive family network. Unfortunately, some parents appeared surrounded by the pervasive negativity of some professionals. This disabling attitude on the part of some professionals gave parents little hope for their child's future, and this may further disable them and their children by affecting their willingness to engage with

services.

In terms of support, there is no way to identify the importance of different types of support without asking the parents themselves. Many parents felt that support meant being given medical services to enable their child to become more independent, or to ameliorate a disability. However, this may change as daily life is never static and emotional support, support for siblings, financial support, or support for travelling takes precedence. The daily demands of caring for a child with disabilities means that most parents are tied to a day-to-day existence and the greater the level of impairment, the higher the number of demands. Some parents interviewed were performing the role of an intensive care nurse; giving intra-venous injections, ventilating their child, using pulse-oximeters, dealing with incontinence, dressing open areas, administering medication, waking throughout the night to tend to their child. These daily demands made the invitation to a dental examination as part of the present research project a low priority.

Chapter 5 Discussion

This study of pre-school children with disabilities was undertaken to investigate two main questions:

- What is the dental health status of pre-school children with disabilities in the Republic of Ireland?
- Does early intervention with parental education, followed by intensive, evidence-based clinical prevention and dental treatment, ensure that pre-school children with disabilities remain caries free?

This study reports on the first three years of this longitudinal research project. The discussion will summarise the most relevant findings of this study in relation to the two questions and the limitation of the findings will also be discussed.

5.1 Secure Online Data Collection System

Before clinical and questionnaire data collection could commence, a suitable data collection system had to be developed and to be operational. Paper and pencil based field surveys are still important instruments in health sciences research, but these standard approaches to data recording and processing are cumbersome, time-consuming and error-prone. For example, upon survey completion, the paper forms are sent for double data entry by independent data entry personnel, before resolution of any discrepancies between the two entries by a third person. This process is intended to ensure that the data available in the database are a true reflection of the information on the forms. However, errors or omissions may not be detected, which reduces the quality of the collected data. Recent research reported that handheld computers were found to be 23 percent faster and 58 percent more accurate than paper and pencil recording (Palen et al., 2008). Data entry at the point of collection is one strategy, which reduces risks for such errors. Data entry at the point of collection enables instantaneous range, consistency and logical checks at the time of data entry, enhancing data quality and dramatically reducing the time until data are available for analysis. Furthermore, Haller et al. (2009) found in their crossover randomized comparative trial between laptops and handheld computers for electronic data collection in clinical research that laptop computers demonstrated clearly higher accuracy than handheld computers for electronic data recording. In their study the overall duration of the recording process was significantly reduced (2.0 mins. versus 3.3 mins.) when data were recorded on a laptop computer. The overall data accuracy also improved when the

laptop was used. It reduced typing errors from 8.4 to 5.8 and missing data from 22.8 to 2.9 per 1000 entries.

In addition, the automated data upload from tablet-PCs via wireless broadband internet connection (3G) to the secure server significantly reduced the risk of data loss due to tablet-PC damage, theft or loss because of the time elapsed between data collection and data upload. It is for those reasons that the quality of the data of the present study, where online data collection was performed with a tablet-PC, can be considered as highly accurate.

Palen and co-workers (2008) reported in their study technical problems with data upload and download using handheld devices such as personal digital assistants (PDAs) (Palen et al., 2008). Furthermore, difficulties at remote sites with data upload due to electrical interference with telephone lines and switchboard difficulties have been reported (Seebregts et al., 2009). However, the present study did not experience any data loss. While the present system, as any system, cannot exclude fully the occurrence of data lose, the probability of such an event is negligible under the setup of the current system. Furthermore, the automatic uploading of survey data and encrypted access to the web-based interface ensured the highest data security level and respondent confidentiality.

Depending on the population surveyed, another advantage of tablet-PCs becomes apparent. The tablet-PC's ability in diverse populations where multiple languages are spoken, multi-lingual paper assessments are cumbersome and costly (Palen et al., 2008). Tablet-PCs may easily integrate multiple language assessments with a simple drop down menu of language options.

5.2 Quantitative Research

This section refers to the discussion of the systematic empirical investigation of quantitative properties of the collected data and their relationships. The present study had its focus on descriptive research, because no oral epidemiological data had been collected on this group of the Irish child population.

5.2.1 Demography

The demography section will summaries a description of the two sample populations and discusses the accuracy of the data. Furthermore, this section will discuss the advantages of the introduction of geo-coded data in oral epidemiology in the provision contextual relevant information.

5.2.1.1 The Sample

The aim of the study required the identification of the sample frame for pre-school children with disabilities in two HSE administrative areas, HSE North-East (i.e. local health offices in Cavan/Monaghan, Louth and Meath) and HSE South-East (i.e. local health offices in Carlow/Kilkenny, South Tipperary, Waterford and Wexford). The HSE North-East (8.8%) and HSE South-East (9.65%) represent together approximately 18.5 percent of the population of the Republic of Ireland (Central Statistics Office Ireland, 2010). As there was no source available that could provide reliable information on the number of children with disabilities, estimation for administrative purpose was prepared based on census 2002 data (Central Statistics Office, 2010) and Department of Education data (see Section 3.2 of this report).

All families registered with the Early Intervention/Enable Ireland Services in the selected regions were invited to participate in the study. A total of 546 parents / caregivers registered their interest to participate in the study in the two regions. However, the exact number of children who would be considered to be eligible for inclusion in the study remains unknown.

The Health Research Board (HRB) operates two databases on people with disabilities: the National Intellectual Disability Database (NIDD) and the National Physical and Sensory Disability Database (NPSDD). However, registration on these databases is voluntary and an under-representation of young children with an intellectual disability has been acknowledged by the HRB (Kelly et al., 2008). However, the latest annual reports on the two databases (Doyle et al., 2009; Kelly et al., 2009) reported data on 0 – 4-year old children, which therefore allows comparison, to some degree, with the present study. In 2008, the NIDD registered 1272 children aged 0 – 4 years nationally with an intellectual disability. Of these, 42.5 percent were female (541 children) and 57.5 percent male (731 children). Data on the next age-group (5 – 9-year olds) demonstrated a shift in this gender ratio. Approximately 33.1 percent (818 children) were female and approximately 66.9% (1652 children) were male. The NPSDD demonstrated a similar shift in reported gender ratio. In 2008, the NPSDD registered 640 children aged 0 – 4 years nationally with a physical and / or sensory disability. Of these, 41.6 percent were female (266 children) and 58.4 percent male (374 children). Data on the next age-group (5 – 12-year olds) demonstrates a shift in this gender ratio as well.

Approximately 36.1 percent (1881 children) were female and approximately 63.9% (3335 children) were male.

These findings concerning the gender ratio of the two databases for the older age-groups (5-9-year olds and 5-12-year olds, respectively), with considerably more children registered on the database when compared with their respective younger age-group, are very similar to the findings of the present study. This may indicate that the overall registration level of the present study is close to the actual population incidence rate.

Kelly and co-workers (2009) noted for the NIDD that the prevalence rate in 2008 for the 0–4-year olds, at 0.34/1000, was much lower than anticipated. 'Applying the prevalence rate of 4.58/1000 for the 10 – 14-year age group, which is the internationally accepted age range for maximum ascertainment of individuals with an intellectual disability, it is estimated that the number of children aged 0 – 4 years, as recorded on the NIDD in 2008, was underestimated by somewhere in the region of 1200 cases' (Kelly et al., 2009). It is for that reason that the gender ratio in 0 – 4-year olds registered on the NIDD may well be skewed and only the older age-groups give an accurate reflection of the actual prevalence rate. Furthermore, putting this nationwide estimate (i.e. 1272 NIDD registered children plus an estimate of 1200 unaccounted children) in proportion to the number of registered children in present study (546), demonstrates a share of 22.1 percent for the two regions (HSE North-East and HSE South-East), which is not too far off the combined estimated proportion of the total population of 18.45 percent for the two regions (demonstrated previously in Section 3.2). These similarities between estimate based on the NIDD report (Kelly et al., 2009) and actual findings of the present study give confidence in the quantitative quality of participation level and subsequently collected data.

However, the reasons for the discrepancies between estimated incidence rate and actual registration level are complex. One factor that influenced the number of registered children in the present study is the level of diagnosed disability in this age group. Diagnostic certainty of an intellectual disability and subsequent registration on the NIDD only became feasible approximately 10 years ago. As the present study demonstrated, approximately two third of all participating children were diagnosed with cognitive disability, which is very similar to the findings from the NIDD and NPSDD for 0 – 4-year olds. The combined results of the two databases demonstrate 66.5 percent of children with an intellectual disability (1272

children) and 33.5 percent of children with a physical and / or sensory disability (640 children) nationwide. A further comparison with the older age-groups was not viable as NIDD and NPSDD reported their findings for people older than four years of age in differently aggregated age-groups.

Another reason for possible discrepancy between actual incidence rate and registration level in the present study are ethical requirements when conducting such a project. The HSE research ethics committee prohibited a direct transfer of contact details of children registered with Early Intervention/Enable Ireland Services to the principal investigators. It may well be that some parents / caregivers who were invited to participate in the study failed to consent to forward their contact details. However, the number of these children who were registered with the Early Intervention/Enable Ireland Services but did not participate in the study remains unknown. Figures on the number of invited parents / caregivers were not made available to the principal investigators.

Furthermore, it is possible that those who decided to participate did so, because they had a particular concern about their child's dentition. In this case the results may overestimate caries levels of the population. However, it is also possible that those more educated and interested in their children's health decided to participate regardless of their child's needs. Parents / caregivers were not asked the reasons for participation. In this context, it is interesting to note that the number of registered children in the present study was higher in the HSE North-East when compared with the HSE South-East. In contrast, the NIDD registration breakdown for people with an intellectual disability by HSE area presented a different trend. Table 5.1 demonstrates that in the HSE North-East (i.e. local health offices in Cavan/Monaghan, Louth and Meath) fewer patients were registered, when compared with the HSE South-East (i.e. local health offices in Carlow/Kilkenny, South Tipperary, Waterford and Wexford). The national prevalence rate for a registered intellectual disability was 6.14/1000.

Table 5.1: Prevalence Of NIDD Registrations Per 1,000 Of The General Population By HSE Area Of Residence In 2008 (Kelly et al., 2009)

Area	Registrations per 1,000 of the general population
Total population	6.14
HSE North-East:	
-Cavan / Monaghan	5.19
-Louth	8.54
-Meath	4.13
HSE South-East:	
-Carlow / Kilkenny	8.82
-Tipperary (South)	6.84
-Waterford	6.05
-Wexford	7.18

This may indicate that a certain proportion of the target population in the HSE South-East failed to consent to forwarding their contact details to the principal investigators. However, the other reasons for a variation in registration levels may range from difficulties to in obtaining a diagnosis at an early age, which precludes children from registration, parents who do not wish to register their child on a disability database or with a disability service for personal reasons, or a variation in registration levels may well be due to the fact that children with a mild intellectual disability, who tend to be in mainstream settings, do not use specialised services and may therefore not be eligible for registration (Kelly et al., 2009). The qualitative non-response analysis gave further insight in factors that prohibited parents / caregivers to participate in the present study and supplemented the quantitative findings (Section 4.3.2).

5.2.1.2 Social Stratification

The Small Area Health Research Unit (SAHRU) Deprivation Index has been used in the present study as an indicator as to whether families of pre-school children reside in an area considered to be materially disadvantaged, in turn produces an indicator for circumstance in which these families live.

The SAHRU Deprivation Index is a composite of five indicators, which are widely believed to represent or be determinants of material disadvantage. The index is very similar to that developed by Townsend (1987) and Carstairs and Morris (1991) in the UK, but has been adapted for use in Ireland (Kelly and Sinclair, 1997; Kelly and Sinclair, 2007). The current version is based on the 2006 census results and covers 3409 electoral divisions (EDs) nationwide. However, it is important to appreciate that the SAHRU Deprivation Index is not a proxy measure for poverty. The SAHRU Deprivation Index is a measure of relative material deprivation.

The application of the SAHRU Deprivation Index demonstrated no statistically significant difference in deprivation scores between the two sample populations. Both sample population were identified to have a similar deprivation score, which was in 7th decile of the SAHRU Deprivation Index. However, further analysis of the individual median values revealed that the HSE North-East median was lower than the median found in the HSE South-East i.e. the number of families residing in deprived EDs was marginally lower in the HSE North-East.

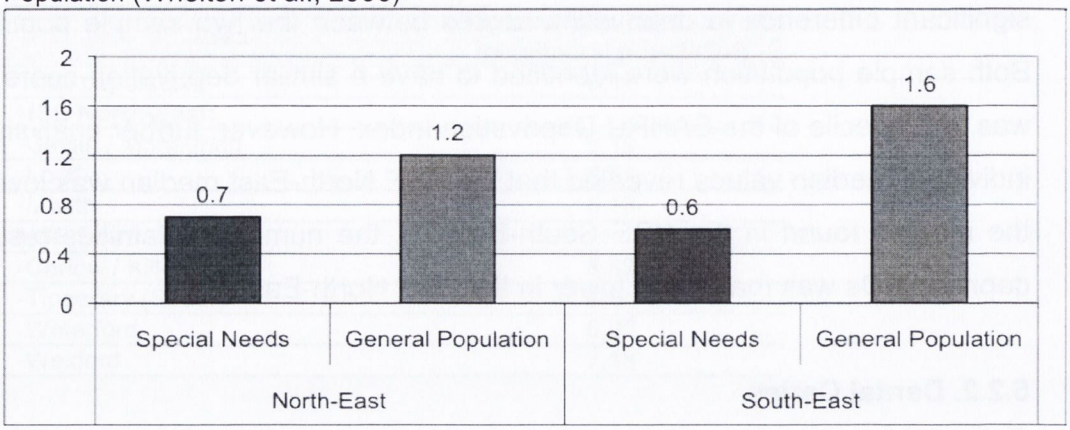
5.2.2. Dental Caries

One of the main aims of the present study was to report on the dental health status in pre-school children with disabilities and to describe its development over time. It is key to establish this knowledge base of dental health levels in pre-school children with disabilities in order to appreciate their needs and enable oral health care providers to develop specific and patient-centred strategies to ensure high levels of oral health related quality of life in this group of the population.

Baseline dental caries levels refer to dental caries prevalence in pre-school children with disabilities at their first examination. Children were continuously recruited by the Early Intervention/Enable Ireland Services over the three year observation period in the two selected regions for inclusion in the study, i.e. the last baseline datasets included in the present analysis were collected and entered in December 2009. It is anticipated that the quality of the database will mature further over time as the number of consecutive follow-up examinations will increase over the next years and subsequently strengthen the monitoring and prognostic value of the database.

In order to appreciate dental caries prevalence in pre-school children with disabilities fully, it is useful to put the findings of the present study in context with data from the general population. However, oral epidemiological data in young children is only available for five-year olds. Comparison of the present results with the findings from the last national dental health survey (Whelton et al., 2006) revealed that dental caries prevalence in 5-year olds with disabilities was lower when compared with the general child population (Figure 5.1).

Figure 5.1: Mean dmft Of 5-Year Olds With Disabilities And Their Peers Of The General Population (Whelton et al., 2006)



The baseline dental caries levels demonstrated that children aged three years or younger exhibited no dental caries in the two regions. This is a quite important finding as this establishes that, for example, nursing bottle caries, or early childhood caries, appeared not to affect young pre-school children with disabilities examined in the two regions, at least in the sample surveyed. This is in clear contrast to the general population, where various studies have found an increased incidence of nursing bottle caries in patients younger than 3 years of age (Shelton et al., 1977). Furthermore, studies on caries aetiology have disclosed risk factors for early childhood caries, such as early colonization and high levels of cariogenic bacteria, poor oral hygiene, enamel hypoplasia, maternal flora, socioeconomic status and parental education level (Chen, 1995; Seow, 1998). These risk factors appeared to be controlled in the children examined in the present study, as they did not present this form of dental caries. This absence of significant levels of dental caries at an early age will positively influence these children's development, because severe dental pain would affect their daily life. It has been shown that early childhood caries adversely affect a child's development, especially body weight and height (Ayhan et al., 1996).

However, the baseline data revealed that from the age of four, dental caries was detected in the sample population, which increased in the older age groups.

The analysis of the data demonstrated that this occurrence of dental caries in the sample population was not linked to their family's deprivation status, which was defined by the level of material deprivation of the electoral division (ED) of residence. This suggests that any preventive intervention for pre-school children with disabilities should benefit all children equally. Identification of children with a socially disadvantaged background and using this indicator as a sole marker to

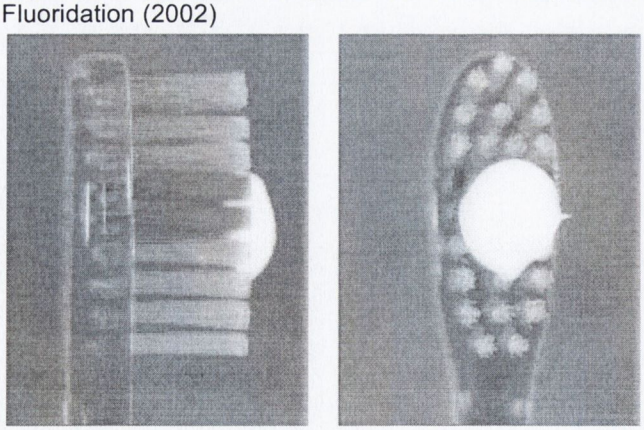
prioritise services may not yield any substantial dental health improvements in this section of the child population.

As the development of dental caries in the dentition is a slow process, the prevention of the development of dental caries has to commencing before it has been detected at the level of dentine. Current dental health policy in the Republic of Ireland (Forum on Fluoridation Report, 2000) generally recommends advising parents / caregivers not to use toothpaste when brushing their children's teeth until the age of two years. Prior to this age, parents / caregivers are advised to brush their children's teeth with a toothbrush and tap water. However, the Forum on Fluoridation (2002) recommends in its report to sought professional advice on the use of fluoride toothpaste in children considered to be at high risk of developing dental caries below two years of age. The Forum on Fluoridation (2002) did not discourage the use of fluoridated toothpaste in children aged 0 – 2 years, if its use is considered an appropriate preventive measure. This part of the recommendation should be strengthened and clarified for the population examined in this study and should become better known by oral health professionals in the Republic of Ireland as current dental health education practice does not fully appreciate this recommendation. Marinho and co-workers (2003) found, in their review on effectiveness and safety of fluoride toothpastes in the prevention of caries in children and adolescence, that the benefits of fluoride toothpastes are firmly established. However, concern has been expressed that dental fluorosis, enamel defects caused by young children chronically ingesting excessive amounts of fluoride during the period of tooth formation (up to the age of six years), is increasing in both fluoridated and non-fluoridated communities, and the early use of fluoride toothpastes by young children may be a risk factor (Ellwood and O'Mullane, 1995; Horowitz, 1992; Stookey, 1994). However, Wong et al. (2010) found in their systematic review on topical fluoride as a cause of dental fluorosis in children that most of the available evidence focuses on mild fluorosis. Furthermore, they found only weak, unreliable evidence that starting the use of fluoride toothpaste in children less than 12 months of age may be associated with an increased risk of fluorosis.

The usual concentration of fluoride in toothpastes is 1000/1100 parts per million (ppm F). In addition, 'child toothpaste', toothpastes often containing lower than conventional fluoride levels (around 500 ppm F) is also available in the Republic of Ireland. The analysis of the questionnaire data revealed that a certain number of

children used such toothpaste with reduced fluoride levels. However, the evidence of the effectiveness of low fluoride-containing toothpastes in reducing dental caries appears to be conflicting. Walsh and co-workers (2010) concluded in their systematic review on different fluoride toothpaste concentrations for preventing dental caries, that preventing dental caries in children and adolescents was only significantly increased for fluoride concentrations of 1000 ppm and above, when compared to placebo, and that the decision of what fluoride levels to use for children under six years should be balanced with the risk of fluorosis. This risk of fluorosis is related to the amount ingested and the fluoride concentration. Chronic ingestion of fluoride from toothpaste in children is common (Bentley et al., 1999; Rojas-Sanchez et al., 1999) and despite the large variation in the amount swallowed, the younger the children are, the more likely they are to swallow larger amounts (Levy, 1994; Lewis and Limeback, 1996). Although the amount of fluoride ingested beyond which fluorosis may occur is not known, a threshold of 0.05 to 0.07 mgF/kg body weight has been suggested (Burt, 1992). A child-sized toothbrush covered with a full strip of toothpaste holds approximately 0.75 to 1.0 g of toothpaste, and each gram of fluoride toothpaste, contains approximately 1.0 mg of fluoride. Children younger than six years may swallow an estimated 0.3 g of toothpaste per brushing (i.e. 0.3 mg of fluoride) (Levy, 1994). For this reason it is generally recommended that children younger than six years of age should be supervised when brushing their teeth, and that no more than a pea-sized amount (Figure 5.2) should be used.

Figure 5.2: Pea-sized Amount Of Fluoride Toothpaste As Recommended By The Forum On Fluoridation (2002)



The analysis of the questionnaire data demonstrated that the real life consumption pattern of the majority of children examined fulfill these recommendations. The majority of children are supervised by their parents / caregivers when brushing

their teeth and parents / caregivers commonly use a pea-sized amount of toothpaste. For that reason, there should be a balanced consideration between the benefits of topical fluorides in dental caries prevention in a specific group of the child population and the risk of the development of fluorosis. The Forum on Fluoridation (2002) recognized the exposure to multiple sources of fluoride for the Irish population and redefined the optimal level of fluoride in the Irish drinking water to a range of 0.6 to 0.8 ppm F, with a target of 0.7 ppm F, in order to minimize the risk to develop dental fluorosis. Therefore, it is reasonable to suggest that pre-school children with disabilities as a group will further reduce their risk of developing dental caries, if fluoridated toothpaste with a fluoride concentration of 1000/1100 ppm F will be used when the first teeth appear in the oral cavity and not to wait to use fluoridated toothpaste until these children have reached the age of two. The analysis of visual changes in the appearance of enamel of the present study demonstrated a regional variation in DDE Index scores. However, the overall scores in relation to fluorosis appeared to be low in both regions and therefore favours a policy aimed towards early fluoridated toothpaste use in this section of the child population, at a fluoride concentration level of 1000/1100 ppm.

Alternative and additional ways to provide an optimal supply of topical fluoride in young children with disabilities at risk of developing dental caries include the use of fluoride varnish and the application of slow-release fluoride devices. Professionally applied fluoride varnishes to prevent dental caries have been widely used in Europe, Scandinavia and Canada (Bawden, 1998; Kallestal et al., 1999; WHO Expert Committee on Oral Health Status and Fluoride Use, 1994). Varnishes were originally developed to prolong the contact time between fluoride and dental enamel, as they adhere to the tooth surface for longer periods (12 hours or more) in a thin layer, and prevent the immediate loss of fluoride after application, thus acting as slow-releasing reservoirs of fluoride (Ogaard, 1994). The two main varnish preparations, Duraphat and Fluor Protector, contain sodium fluoride in a concentration of 22600 ppm F and difluorsilane in concentration of 7000 ppm F respectively. Varnishes are usually applied with small brushes, syringes, or cotton pellets, with or without prior dental prophylaxis, at the frequency of two to four times a year. They are considered safe, despite their high fluoride concentration, because the amount of varnish usually applied to treat one child is only 0.5 ml on average (Ripa, 1990; Petersson, 1993), which delivers 3-11 mg of fluoride ion. This is far below the probable toxic dose of 5 mg/kg body weight (Whitford, 1992),

even with the potential exposure (ingestion) varying from 3.5-11.3 mg of fluoride ion (Johnston, 1994). Several clinical trials and reviews evaluated the caries preventive effect of fluoride varnishes in the permanent and primary dentition (Beltran-Aguilar et al., 2000; Clark, 1982, 1985; de Bruyn and Arends, 1987; Helfenstein and Steiner, 1994; Petersson, 1993; Primosch, 1985; Seppa, 1991) and suggested a substantial caries-inhibiting effect. Autio-Gold and Court (2001) found in their assessment of the effects fluoride varnish on early enamel carious lesions in the primary dentition that fluoride varnish applications may be an effective measure in reversing active pit- and-fissure enamel lesions.

The National Health Service (NHS) in the UK published in 2009 guidelines (NHS, 2009) on the application of fluoride varnish by dental nurses. The legal framework in the UK allows dental nurses, after appropriate training, to apply fluoride varnish on the prescription of a dental surgeon. This potentially increase the number of people competent to apply fluoride varnish and may result in a better use of fluoride varnish and, subsequently, reduced risk of the development of dental caries. Experience gained with this model of supply of fluoride varnish may form a stepping stone in the development of new strategies on the use of fluoride varnish within the framework of HSE services.

Another way to provide an optimal supply of topical fluoride in young children with disabilities at risk to developing dental caries are intraoral slowly dissolving fluoride glass beads (Toumba and Curzon, 1993). The glass beads, which are 4 mm in diameter, are attached to the buccal aspect of molar teeth using acid-etch composite. The percentage of incorporated fluoride can be adjusted to vary the amount released and therefore adjusted to current water fluoride levels. It has been shown that these glass beads lead to raised salivary fluoride levels for up to 2 years (Toumba and Curzon, 1993). Concerns that accidental swallowing of these devices might lead to gastric irritation or adverse effects following raised plasma fluoride concentrations have been investigated and it has been shown that fluoride released from slow-dissolving glass did not present a health risk. (Curzon and Toumba, 2004).

However, these proven concepts and strategies of dental caries prevention have to be embedded in a wider concept of care. The American Academy of Pediatrics (2002) developed the concept of the 'medical home' and recommended that 'the medical care of infants, children, and adolescents ideally should be accessible, continuous, comprehensive, family centred, coordinated, compassionate, and

culturally effective. It should be delivered or directed by well-trained physicians who provide primary care and help to manage and facilitate essentially all aspects of pediatric care'. Furthermore, the American Academy of Pediatrics stated in 2003 that paediatric primary dental care needs to be delivered in a similar manner. This concept, the 'dental home' is a specialised primary dental care provider within the framework of the 'medical home' (Hale et al., 2003). The American Academy of Pediatric Dentistry refined this concept and defined it as '....an ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family-centered way. Establishment of a dental home begins no later than 12 months of age and includes referral to dental specialists when appropriate' (American Academy of Pediatric Dentistry, 2008). This concept of a 'dental home' may well be used as a template and adapted to local needs and levels of available resources. Referring a child for an dental health examination by a dentist who provides care for infants and young children six months after the first tooth erupts or by 12 months of age establishes the child's dental home and provides an opportunity to implement preventive dental health habits that meet each child's unique needs and keep the child free from dental or oral disease.

The evidence from the present study suggests that an adjustment of current oral health prevention practice may lead to a reduction in dental caries prevalence in pre-school children with disabilities. These adjustments may include within the framework of establishing a 'dental home':

- the inclusion of pre-school children with disabilities from six month after the first tooth erupts or by one year of age (whichever comes first) in a routine oral heath care programme with regular oral health examinations and risk assessment. The recall intervals between routine oral health examinations should be based on established and tested guidelines (National Institute for Clinical Excellence, 2004) and should be adapted to local conditions;
- the use of fluoridated toothpaste with a fluoride concentration of 1000/1100 ppm F when the first teeth appear in the oral cavity in all pre-school children with disabilities;
- pre-school children with disabilities with a heightened risk to develop dental caries may benefit from an additional application of fluoride varnish as part of the routine oral heath care programme;
- pre-school children with disabilities who require treatment under general

anesthesia (GA) should be provided with slowly dissolving fluoride glass beads when treated under GA. These glass beads have to be adjusted for patients residing in regions with water fluoridation, in order to reduce the risk of developing any enamel opacities.

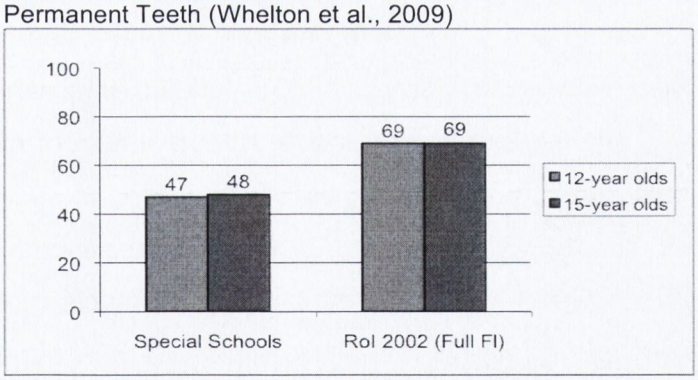
5.2.3. Fissure Sealants

Sealants were introduced in the 1960s to protect pits and fissures on the occlusal tooth surfaces from dental caries. Such sealants prevent the growth of bacteria that promote decay in pits and fissures in teeth. Ahovuo-Saloranta and co-workers (2008) concluded, in their review on pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents that sealing is a recommended procedure to prevent dental caries of the occlusal surfaces of permanent molar teeth. Currently there are two main types of pit and fissure sealant materials available: resin-based sealants/composites and glass ionomer cements. The effectiveness of resin-based sealants has been demonstrated in many studies (Llodra et al., 1993; Mejàre et al., 2003) and the effectiveness depends on the longevity of sealant coverage (Ripa, 1993). Fluoride containing resin-based sealants have been developed as well. However, whether the fluoride release from sealants has any additional beneficial effects in caries prevention is questionable (Carlsson et al., 1997). The second main type of sealant material is glass ionomer cements. Studies on these sealants have been conducted by several researchers (Boksman et al., 1987; Forss and Halme, 1998; Mejàre and Mjor, 1990). However, the results of glass ionomer sealant studies have so far been conflicting. Glass ionomer cements contain fluoride and they are thought to prevent caries through their fluoride release. The main disadvantage of glass ionomer sealants has been inadequate retention. Nevertheless, it has been suggested that glass ionomer sealants, through their fluoride release, can prevent the development of caries even after the visible loss of sealant material (Seppa, 1991). Furthermore, glass ionomer sealant is less demanding in terms of moisture control and require less treatment time. These may well be important factors for frontline dental professional to decide to use this type of fissure sealant especially in this patient group.

The present study demonstrated that the number of children with at least one sealed primary or permanent tooth was very low. Several reasons may have an impact on the low prevalence of fissure sealants. The single most important factor

for this finding is that current HSE policy in most areas only makes provisions to provide emergency treatment for pre-school children, regardless if they have a disability or not. No routine dental care is provided for children in this age group, which makes it quite unlikely to find this preventive measure in children examined in this study. Current HSE policy makes provisions for routine dental care only for school-aged children, adolescence and adults. However, the 'Children's Oral Health 2002' survey (Whelton et al., 2006) revealed that there were still considerable differences in the provision of dental services between different HSE administrative regions in the Republic of Ireland. For example, in the general population the proportion of 8-year-olds, which was the youngest reported age group, who had at least one fissure sealant on their permanent teeth, was in the former North Eastern Health Board region 49.9 percent and in the former South Eastern Health Board region 40.1 percent. The national average was reported to be 47.1 percent. Furthermore, Whelton and co-workers (2009) found in their report on the dental health of children attending special needs schools and day care centres, which only reported on fissure sealant levels in 12-and 15-year-olds, a lower prevalence of fissure sealants in children with disabilities when compared with their peers in the general population (Figure 5.3).

Figure 5.3: Percentage Of 12- And 15-Year Olds With At Least One Fissure Sealant On Their Permanent Teeth (Whelton et al., 2009)



This indicates difficulties in adherence with current guidelines by frontline oral health care providers. Kumar and Wadhawan (2002) examined the extent to which fissure sealants were targeted to high-risk children in school-based programmes in New York State and identified some of the reasons that prevent the implementation of guidelines in fissure sealant programmes. The authors found a wide variation in the extent to which the fissure sealant guidelines were implemented. A wide disparity in the presence of fissure sealant on children's permanent teeth was found. Difficulty in assuring parents and local dentists that

some children were not at risk for caries; lack of confidence in the risk-assessment method; fear of misclassifying children and requests by school administrators, parents and local dentists that all children should benefit from preventive measures were named as reasons for not adhering to the guidelines.

The evidence from the present study suggests that a HSE policy change, which should recommend the application of fissure sealants in all children with disabilities from the time that the occlusal surface is visible, may considerably reduce the risk of developing dental caries in permanent molar teeth. Depending on the patients' cooperation and moisture control, clinicians have to decide which fissure sealant material is most appropriate for the individual patient. In addition, adequate training in the implementation of the guidelines on the application of fissure sealants through lectures, written protocols and site visits might be beneficial.

5.2.4 Visual Changes in the Appearance of Enamel

Amelogenesis, which takes place within the tooth germ, is a process, which can be divided into two distinct stages (Simmer and Hu, 2001). In the first stage, the secretory phase, partially mineralized enamel (30%) is produced. Once the full width of this enamel has been deposited, the second stage, maturation, commences, and organic material and water in the enamel are removed in order to allow a replacement with minerals (Suckling, 1989). Ameloblasts, which are involved in the two stages of enamel formation, require a good supply of nutrients and enzymes, such as alkaline phosphatase, in order to produce and secrete the organic matrix (Sasaki et al., 1997). Systemic or local disturbances to the ameloblasts while they are active can result in developmental defects of enamel (DDE) (Suckling, 1989). If secretory ameloblasts are damaged, then hypoplastic defects and opacities may occur. During the maturation phase, interference with ameloblast function can lead to bands or patches of chalky opaque porous enamel (Fearnhead et al., 1982; Moss-Salentijn and Hendricks-Klyvert, 1990). Subsequent recovery of some of the ameloblasts from the insult during the maturation phase may account for the varying colour and degree of mineralization of the opacities that are known to occur (Hall, 1994). Fluorosis is the best known, but not the only cause of visual change in enamel. Small and Murray (1978) and Pindborg (1982) proposed more than 50 aetiological factors of DDE apart from fluoride. Increased DDE-Index results in primary teeth have been found in children born preterm

(Fearne et al., 1990), with low birth weight (Aine et al., 2000), respiratory distress syndrome (Johnsen et al., 1984), malnutrition, mineral deficiencies, hypocalcemic conditions, hyperbilirubinemia, infections during fetal life and neonatal period (Seow, 1991) and after local traumatic injury by laryngoscopy and endotracheal intubation (Seow et al., 1984). These risk factors are more likely to occur in children with disabilities and the probability of the occurrence of DDE may well be additionally increased in children who live in regions with fluoridated water (Forum on Fluoridation, 2002).

In the present study the modified Developmental Defects of Enamel (DDE) Index (Clarkson and O'Mullane, 1989) was used, in order to measure the various visual changes in the appearance of enamel. In the present study the different categories of the DDE-Index were collapsed into two category ('At least one DDE score' – 'No DDE score') in order to allow better statistical analysis of the data. The present study demonstrated that children who consume fluoridated water show higher levels of visual changes in the appearance of enamel in both regions. However, a considerable regional variation became apparent. There are only few epidemiological studies of the prevalence of DDE in primary teeth available and these studies demonstrated a great variability in DDE-Index results (Grahnén et al., 1974; Infante and Gillespie, 1974; Lukacs et al., 2001; Murray and Shaw, 1979; Slayton et al., 2001; Weeks et al., 1993).

Lunardelli and Peres (2005) found in their cross-sectional study on 431 three to five year-old children who resided in water fluoridated Itajaí (Brasil) a DDE-Index score of 24.4 percent. This result is approximately half-way between the DDE-Index scores found in the HSE North-East (48.3 percent) and HSE South-East (9.6 percent) in children who resided in households connected to the public water supply. Li et al. (1995) found in their study in 1344 three to five-year-old Chinese children very similar results. They detected a DDE prevalence of 23.9 percent in the primary dentition.

Another aspect that may have influenced the DDE-Index results is the diagnosis practice of DDE. Enamel hypoplasia and demarcated opacities are easily detected due to their characteristic clinical appearance. However, diffuse opacities, the larges subgroup recorded in the present study, have not such non-ambiguous characteristics and do not present a precise border with the adjacent normal enamel. Seow (1997) found in his study that the whiter appearance of the deciduous enamel can impede the detection of milder opacities, which are

common in the deciduous dentition. Whereas defects of the enamel can be masked by saliva, plaque and inadequate illumination. However, the meticulously performed calibration before commencement of the study and subsequent re-calibration while conducting the fieldwork gave no indication of such a problem. Anyhow, it has to be noted that the calibration of the DDE-Index was undertaken with the aid of slides, because no sufficient numbers of pre-school children were available for the calibration exercise.

The exact mechanism through which dental fluorosis develops is not fully understood (Forum on Fluoridation, 2002). There is some evidence in support of the hypothesis that excessive levels of fluoride can interfere with dental enamel formation and cause fluorosis (Chen, 2006; Kubota et al., 2005). At present, there are insufficient data available to aid in determining the exact causative factors, which resulted in this variation in visual changes in the appearance of enamel and to which degree fluoridation influenced it, given that the teeth examined were primary teeth. Fluoride levels in water were under rigid control since it introduced in 1964 and rarely deviating more than 0.1ppm from the standard range of 0.8-1.0ppm (Forum on Fluoridation, 2002). This regional variation in terms of fluoride consumption may be a result of small contributions from a number of sources, such as toothpaste, supplements, and diet rather than from a single source and may contributed to the variation found in DDE levels.

5.2.5 Oral Hygiene Assessment

Dental caries, gingival and periodontal infections require colonization by aetiological pathogens before disease can occur. Colonization by *Streptococcus mutans*, the principal species associated with caries was found to occur during a window of infectivity between 19 and 31 months of age (Caufield et al., 1993). The principal periodontal pathogens *Porphyromonas gingivalis, Bacteroides forsythus*, and *Actinobacillus actinomycetemcomitans* were not detected by culture in children less than 2.5 years of age (Frisken et al., 1990; Kononen, 2000). Using PCR-based methods, however, investigators have detected *P. gingivalis* and *A. actinomycetemcomitans* in the saliva of infants and young children (McClellan et al., 1996; Lamell et al., 2000). Tanner and co-workers (2002) concluded, in their study on microbiota of young children from tooth and tongue samples, that a wide range of species, including *S. mutans* and putative periodontal pathogens, were detected in children younger than three years of age. It is because of these

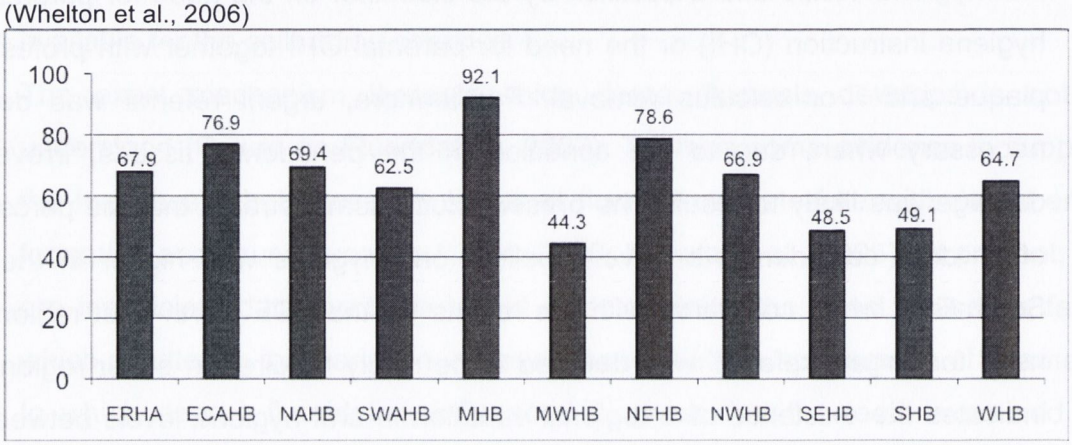
findings that good oral hygiene levels in pre-school children with disabilities should be considered as an important cornerstone in the development and assessment of appropriate oral health prevention programmes. However, there is a scarcity of literature on the oral hygiene status of children and adolescents with disabilities.

The clinical examination of participating children included an assessment of the oral hygiene status and a decision by the examiner on the need for parental oral hygiene instruction (OHI) or the need for parental OHI together with professional plaque and / or calculus removal. Furthermore, urgent referral was deemed necessary when, due to the condition of the periodontal tissues, irreversible damage was likely to result. The present study demonstrated that the percentage of children considered to have excellent oral hygiene was higher in the HSE South-East when compared with the results for the HSE North-East region. The need for 'urgent referral' was deemed to be rarely required in either region. This indicates the existence of a regional variation in oral hygiene levels between the two regions.

Nicolaci and Tesini (1982) observed that the high prevalence of poor oral hygiene is usually more evident in the patients with a cognitive disability and that a correlation between the level of oral hygiene and severity of the disability exists. A lack of proper oral hygiene has been suggested to be the principal cause of periodontal disease in special needs patients (Nunn and Murray, 1987; Shaw et al., 1986). Prolonged retention of food particles in the oral cavity might result in more gingival inflammation and eventually lead to periodontal disease. Furthermore, the oral hygiene condition may be influenced by the severity of impairment and living conditions. Young children with special needs may have greatly varying limitations in oral hygiene performance or in their acceptance of assisted toothbrushing due to their potential motor, sensory and intellectual disabilities (Dahle et al., 1989; Kamen et al., 1989; Nunn, 1987). This may considerably limit parental oral hygiene efforts and result in poor dental health. Furthermore, because young children with disabilities dependent on parents, siblings or caregivers for oral care, a lack of parental knowledge of oral hygiene practice will negatively influence the child's oral well being (Bonito, 2002). Earlier reports suggested that the prevalence of dental disease tends to be affected by demographic factors (Tesini and Fenton, 1994). This multipliaty of factors may have caused the observed differences in oral hygiene levels between the two regions.

Whelton et al. (2006) found a similar variation throughout the sample in their study of school-aged children in the general population. For example, the category 'no treatment required' varied from 44.3 percent in the former Mid-Western Health Board (MWHB) region to 92.1 percent in the former Midlands Health Board (MHB) (Figure 5.4).

Figure 5.4: Percentage Of 5-Year Olds With 'No Treatment Require' By Health Board In 2002 (Whelton et al., 2006)



In addition, Whelton and co-workers (2006) acknowledged that this variation is due to many reasons, but suggested that an important reason may well be 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, as this visual examination lacks precision and may reflect to some degree the subjective nature of the criteria used. This could explain the lack of improvement in recorded oral hygiene levels over time found in the present study in the HSE North-East.

5.2.6 Toothwear

Dental erosion is defined as the loss of dental hard tissue due to the chemical influence of extrinsic and intrinsic acids without bacterial involvement (Imfeld, 1996). Although prevalence data on erosive lesions of permanent teeth have been published in recent years (Nunn, 1996), not much prevalence data on dental erosion in the primary dentition is available and show varying results. The number of children exhibiting at least one tooth with erosive wear ranged from 30.0 percent to almost 100.0 percent (Al-Majed et al., 2002; Ganss et al, 2001; Jones and Nunn, 1995; Millward et al, 1994; O'Brien, 1993; Wiegand et al., 2006). However, the results of these studies are difficult to compare due to different diagnostic criteria and sample population.

The present study assessed the prevalence of erosion in pre-school children with disabilities. The occlusal surfaces of the second primary molar teeth or the first permanent molar teeth and the labial and palatal surfaces of the incisor teeth were assessed for loss of surface enamel characteristics, and / or exposure of dentine or pulp. The present study found that of all children examined at baseline in the HSE North-East, approximately 23.0 percent had at least one tooth affected by erosion and in the HSE South-East, approximately 31.3 percent had at least one tooth affected by erosion. This indicates a regional variation in the prevalence of dental erosion in the sample population. However, these prevalence levels are in the range of previously published epidemiological research. For example, Wiegand and co-workers (2006) found, in their study on the prevalence of erosive toothwear in even-year-old German kindergarten children, a prevalence of 32 percent while using similar assessment criteria as in the present study. However, Kreulen and co-workers (2010) found in their systematic review of the prevalence of toothwear in children and adolescents, a substantial heterogeneity in the prevalence of toothwear involving dentine ranging from zero to 82.0 percent for deciduous teeth in children up to seven years. As erosion of primary teeth is considered to be a predictor for erosion and general toothwear of the permanent dentition (Ganss et al., 2001), preventive care and appropriate treatment are required in affected children in order to avoid an increase oral ill-health in these children.

5.2.7 Trauma

The present study examined upper and lower primary or permanent incisors for traumatic injuries. Analysis of the baseline clinical data revealed that evidence of of trauma was sparse in the sample population and limited to primary teeth. Approximately 10.3 percent of the sample population in the HSE North-East and approximately six percent of the sample population in the HSE South-East showed traumatic injuries to primary incisor teeth. Furthermore, the majority of traumatic dental injuries occurred in the two older age groups ('4-6-year-olds' and '≥7-year-olds'). However, none of the affected teeth showed any signs of restoration. There are few epidemiological studies available on dental trauma among pre-school children. Glendor (2008) found, in his literature review of the epidemiology of traumatic dental injuries, that approximately one third of all pre-school children suffered a traumatic dental injury involving the primary dentition and approximately one fourth of all school children experienced trauma to the permanent dentition, but variations were observed between and within countries. For example, studies carried out in Brazilian pre-school children found a prevalence ranged from 9.4 percent to 36.8 percent (Bijella et al., 1990; Caldas and Burgos, 2001; Granville-Garcia, et al., 2006; Kramer et al., 2003; Mestrinho et al., 1998; Oliveira et al., 2007) in traumatic dental injury. This variation may be caused by differences in data collection method, sample selection and the location where the study was conducted. In the present study, traumatic dental injuries were not frequent in children younger than three years of age. This was possibly due to the restrictions of movement at this age group. However, when the children become older and more independent, they may become more prone to dental trauma. The most frequent types of trauma were enamel fracture and crown discolouration in the HSE North-East and this is in agreement with other previously published research (Carvalho et al., 1998; Granville-Garcia et al., 2006; Kramer et al., 2003). The present study did not investigate reasons for not restoring traumatized primary front teeth. However, parents / caregivers may not have enough information concerning the consequences of trauma to primary teeth. Research in children on the affect of untreated traumatic dental injuries on quality of life demonstrated that children with traumatized teeth were 20 times more likely to report a negative impact on quality of life when compared with their non-affected peers (Cortes et al., 2002). Therefore, the impact of traumatic dental injuries on the quality of life of

pre-school children with disabilities should not be underestimated and may requires more awareness from parents / caregivers and oral health professionals.

5.2.8 Questionnaire: Dental health Behaviour, Attitudes and Knowledge

Oldenburg (1994) argues that 'with the identification of the importance of behavioural, cultural, social and economic factors as determinants of disease, there is a need for all interventionist strategies and approaches, particularly those focusing on lifestyle change, to take account of these'. One aim of this study was to report on the dental health behaviour, attitudes and knowledge of parents / caregivers of pre-school children with disabilities. The questionnaire results demonstrated that parents / caregivers of pre-school children with disabilities had a high level of basic dental health knowledge in both regions at baseline with a slightly higher knowledge base in the HSE South-East. This may be explained by parental believe that the health of their children could be affected by dental caries. Al-Sarheed et al. (2000) found in their study on the oral status and reported oral care of children with heart and heart-lung transplants that parents of children in the transplant group were more likely to believe that the health of their children could be affected by dental decay and were more aware of the importance of dietary sugar in causing dental caries. Overall, this dental health knowledge is encouraging as it indicates that those parents are recalling general dental health advice.

In addition, the vast majority of parents /caregivers (more than 90%) in both regions thought that teeth should be brushed twice or more than twice a day and that commencement of tooth brushing should occur when the teeth come through. These are important findings as international research in child dental caries demonstrated that a strong association exists between being caries free at four-years and onset of toothbrushing prior the age of two years (Adair et al., 2004; Pine et al., 2004). However, Huebner and Riedy (2010) found no single explanation for initiating brushing. The most common reason was in their study an external cue – the eruption of the child's first teeth. The extent to which this belief was based, in the present study, on advice given by public health nurses, other health or oral health professionals, or peers remains unknown.

Furthermore, the distribution of answers with regards to dental health knowledge did not change in the HSE North-East between the baseline examination and the second examination (i.e. after one year of exposure to the dental health prevention

programme). Bauchner and co-workers (2001) found similar results in their randomized, controlled trial of a health intervention programme on the improvement of parent knowledge, beliefs, and behaviours on the appropriate use of oral antibiotics. They suggested "because of numerous campaigns of various professional societies and many articles in the popular press, it is possible that parents have become more knowledgeable about antibiotic resistance over the past few years. If this occurred, it would have been more difficult for the intervention to improve parent knowledge and change belief and behaviours" (Bauchner et al., 2001) and therefore concluded that a minimal increase may be due to parents being already knowledgeable at baseline. It can be agued that a similar pattern exists in oral health care and has resulted in a high level of baseline dental health knowledge with regards to toothbrushing, which did not change much over time. However, Blinkhorn et al. (2001) demonstrated that effective toothbrushing requires more than just knowing it is important. In their study they collected information on oral hygiene knowledge and undertook direct observation of mothers brushing their pre-school children's teeth. They found, for example, that the majority of mothers knew they should brush twice daily (71%), but only 40 percent showed adequate toothbrushing skills.

The majority of parents / caregivers reported in the present study to help their child to brush his / her teeth. This is similar to other reports on pre-school children of the general population (Finlayson et al., 2007; Zeedyk et al., 2005). However, assistance in those reports referred predominantly to hands-off supervision. Other research of mothers of older pre-school children found that nearly half of them stated that their child brushed his / her teeth on their own, i.e. without any parental / adult participation (Franzman et al., 2004). This is in contrast to the findings of the present study where adults were actively engaged in toothbrushing.

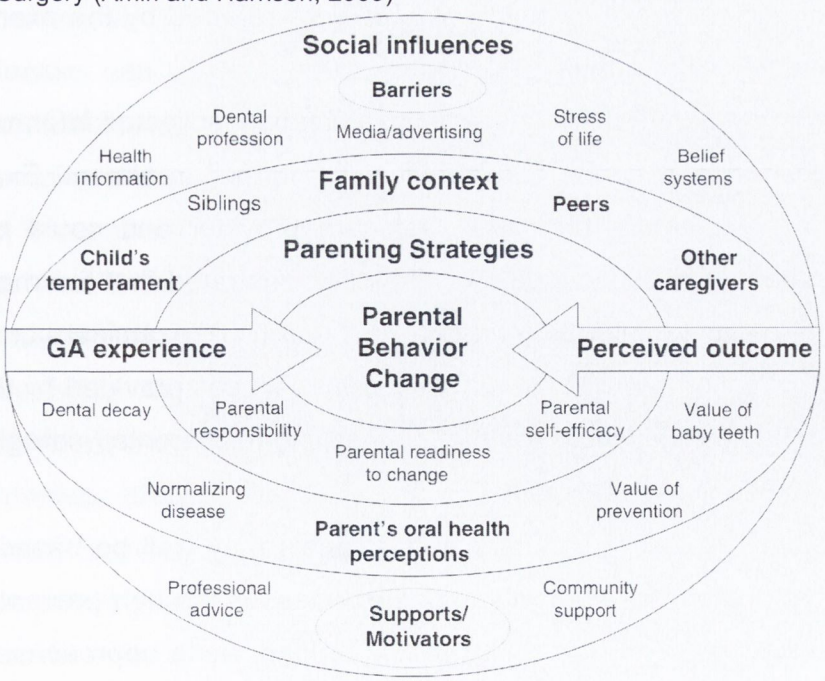
However, parental intention to apply knowledge may be impeded by an individual's lack of skills but also by external constraints. Parents / caregivers may not physically be able to brush their child's teeth due to a lack of co-operation of the child. Amin and Harrison (2009) found in their study on parents' dental health behaviours for their young children, that a child's temperament was perceived as a major barrier to success by parents.

The questionnaire revealed a high level of parental confidence in being able to carry out dental health related tasks (i.e. toothbrushing) and the majority rated the quality of their skills a being of a high standard. However, the findings of the oral

hygiene assessment did not reflect this clinically. Parenting skills that support healthy behaviours have received little attention in the dental literature, yet these skills are a critical element of family health care (Amin and Harrison, 2009). Adoption of, and persistence with, healthy behaviours are known to be significantly associated with parents' perception of being able to cope with the care of their child's teeth, i.e. their self-efficacy (Adair et al., 2004). Furthermore, Adair and co-workers (2004) demonstrated that parental self-efficacy is as an important factor affecting parents' control over, for example, their child's snacking and toothbrushing pattern.

However, little is known about parents' own beliefs and understandings of tooth decay in young children (Vaughn and Robinson, 2003). Existing theories of health behaviour only explain about 30% of behaviours (Weinstein and Rothman, 2005). For that reason Amin and Harrison (2009) undertook qualitative research in order to develop a grounded theory to understand the processes that influence parents' adoption of dentally healthy behaviours following the experience of their child's dental general anesthetic. This conceptual model to describe parental behaviour change with regard to their child's dental health may also assist to put questionnaire answers of the present study in prospective (Figure 5.5).

Figure 5.5: Conceptual Model Of Parental Behaviour Change Following Their Child's Dental Surgery (Amin and Harrison, 2009)



The centre of the model is parental behavior change. The four theoretical categories that appear to influence parent's adoption and maintenance of healthy behaviors were social influences, family context, general anesthesia, and

parenting strategies. The model seems to reveal that parent's interaction with the family environment and the environment external to the family has a profound effect on the practices they employ with regard to their child's dental health. The conceptual model to describe parental behaviour change makes transparent that high levels of dental health related parental knowledge or an elevation of dental health related parental knowledge as a result of an dental health education programme, may not result in behaviour change and better clinical dental health examination results as such a programmes may not reduce co-existing barriers and challenges that parents face to improve their child's dental health. The overall positive questionnaire results have to be seen in this light and may explain a discrepancy between recorded knowledge levels and achieved oral hygiene levels and subsequent oral hygiene assessment results.

5.2.9 Referrals

A cornerstone of the piloted oral disease prevention programme for pre-school children with disabilities in the HSE North-East was the provision of parental dental health education and/or preventive treatment depending on the outcome of a comprehensive assessment, which was part of the clinical examination. Children who were deemed to benefit from parental dental health education, preventive procedures and/or a course of dental treatment were referred by the examiner to the most appropriate professional.

The referral forms, prepared after the clinical examination, collected information for onward referral to an oral health care provider for further treatment. Examiners were allowed to select more than one oral care provider and could prioritise treatments as urgent. The present study clearly demonstrated that the majority of referrals went to the oral health promotion (OHP) team, i.e. examiners concluded that the majority of patients would benefit most from services provided by the OHP team (i.e. dental health education and diet counselling for parents / caregivers) in order to improve the child's oral health.

This referral pattern by oral health care professionals may well be based on the biomedical model of disease to target causes of illnesses through preventive and educational approaches. The underlying theory behind these approaches is that once individuals acquire the relevant knowledge and skills (i.e. in this case parents / caregivers), they will then alter their behaviour to maintain optimal oral health (Watt, 2005). However, these approaches to individual oral health education

based on paternalistic supplied information have been shown to be largely ineffective (Satur et al., 2006). Blinkhorn and co-workers (2003) conducted a cluster, randomised controlled trial of the value of dental health educators and confirmed these findings. Dental health educators counseled one group of mothers of pre-school children every four months over a two year period on toothbrushing, fluoride toothpaste and sugar control. The control group parents and pre-school children (HSE South-East) were seen only once at the beginning of the study, when they were given toothbrushing instruction and a tube of fluoride toothpaste. After the two-year period no significant differences in plaque levels were found between the two groups. However, the mothers in the test group were more knowledgeable, had better attitudes towards the dental health of their offspring and better toothbrushing skills than those in the control group (HSE South-East).

It has been suggested that the paternalistic approach of oral health education does not appreciate the broader context determining human behaviours, which have been described as the social determinants of health (Marmot and Wilkinson, 2005; Newton and Bower, 2005) and therefore fail. The causes of oral diseases are grounded in these social determinants of health and the cultural and social circumstances in which people live (Watt, 2007). There is little doubt that dental health behaviours of parents / caregivers are closely connected to the other behaviours they apply to cope with their lives. However, these social and cultural factors can be quite difficult to consider appropriately within the context of the clinical dental setting. Yevlahova and Satur (2009) found in their systematic review on different models for individual oral health promotion and their effectiveness, that it is important to identify the client's specific needs and concerns when attempting to alter a habit or procedure. In order to achieve a change, the recipient of an intervention needs to learn to integrate new skills and knowledge into their everyday life. As the skills are applied to different situations, the individual develops a sense of self-efficacy and confidence in their ability to perform actions, manage challenges and overcome barriers to change. Self-efficacy has been found to play a significant role in determining which activities a person will perform or avoid (Bandura, 1978). Therefore, addressing causes of oral disease in isolation from the caregivers' life and social circumstances is ineffective in both the short and long term. It is for those reasons that the use of oral health education resource pack by health care providers should be complemented by support mechanisms explored as part of the qualitative research of the present study.

Further analysis of the referral forms revealed that more than half of all assessed children were referred for additional treatment provided by dental hygienists (such treatments as plaque and calculus removal). Scaling and polishing of the teeth by a dental hygienist is a non-surgical intervention that is intended to supplement (and is not a substitute for) the child's home-care plaque control. Scaling is the removal of plaque, mineralised plaque deposits, debris and staining from the crown of the teeth. Root surfaces are usually not treated in children. Hand scalers or ultrasonic scalers can be used to perform the scaling procedure. Polishing is the mechanical removal of any residual extrinsic stains and deposits, typically undertaken by using a rubber cup or bristle brush loaded with a prophylaxis paste. It has to be noted that despite the considerable number of referrals for scaling and polishing of the teeth no clear evidence of its long-term benefits exist (Beirne et al., 2008). Given the considerable resources involved in providing routine scale and polish treatments it can be agued that a scale and polish should only routinely be provided to young children if sufficient home-care plaque control is available or/and additional preventive treatments, such as the application of fissure sealants or/and the application of fluoride varnish, will follow the removal of dental plaque and calculus. Scaling and polishing of the teeth in pre-school children with disabilities as a stand-alone measure appears to have a limited sustainable effect on the oral health of these children.

In addition, analysis of the referral forms demonstrated that the medical history in the majority of children was considered a low risk with regard to the risk of acquiring oral ill-health, whereas the fluoride toothpaste status was considered to represent a medium / high risk in the majority of children, i.e. the use of fluoride containing products may not be sufficiently or appropriately used. Furthermore, the present dietary habits of pre-school children with disabilities appeared also to be considered of high / medium risk in the majority of children. It can be agued that the areas of medium and high risk for the development of ill-health in pre-school children with disabilities can be addressed with appropriate oral health education. Motivational interviewing has been shown to be a successful approach to behaviour change. Current literature demonstrates that motivational interviewing has been applied successfully to a variety of fields in health care (Burk et al., 2003; Channon et al., 2007; Dunn et al., 2001; Knight et al., 2006; Tappin et al., 2005) and may usefully be applied to oral health care as well.

Motivational interviewing is an evidence-based, client-centered, practical and

personalized counselling approach that is based on Prochaska and DiClemente's "Transtheoretical Model of Behaviour Change" (Rollnick et al., 2008). The focus of this approach is to prepare people for behaviour change through helping clients to explore and resolve ambivalence about change and make their own decisions about why and how to precede (Rollnick and Miller, 1995; Rollnick et al., 2008). Thus, the person's decisions about behaviour change are simply supported and guided by the health / oral health professional. Motivational interviewing helps to build trust, reduce the individual's resistance to change and aims to alter how the client responds to problematic situations. Studies on motivational interviewing have found that clients feel listened to and understood by their health practitioner, while the health practitioner gains a greater sense of achievement from recognizing developments in the client's readiness to change as important progress, rather than seeing the concrete behaviour change as the only goal (Britt et al., 2004). Most of the studies on motivational interviewing displayed positive results for the effectiveness of motivational interviewing in altering behaviours. Furthermore, a recent systematic review demonstrated positive results for the effects of motivational interviewing on psychological, physiological and lifestyle change outcomes (Knight et al., 2006). However, oral health education for pre-school children with disabilities will continue to have its challenges as behaviour change has to take place within the home setting and requires some degree of co-operation from the child.

5.3 Qualitative Research

The present study investigated the dental health levels of pre-school children with disabilities, a section of the population which has not been investigated previously. It is for that reason that qualitative research has been used along with quantitative research methods in order to assist in the interpretation and to better understand the complex reality of dental health levels in these children.

5.3.1 Coping Strategies of Caregivers of Children with Disabilities

The findings from the focus groups indicate that mothers use a variety of problem-solving, individual and collective coping strategies that enabled coping and the development of resilience. They re-evaluated and redefined their lives as a result. What may have been interesting would have been to explore father's perceptions of coping, because there is an absence of their views from the present study and

indeed from most other research on coping strategies. Under the domain of individual coping, mothers indicated that they had developed greater self confidence and belief in their ability to handle situations, which was reinforced when they withdrew for a while to reappraise and adjust to their situation. One mother who had separated from her partner talked about how he had developed his caring role successfully away from the partnership, but because her partner was not present it was not possible to explore whether his experiences differed from that of the other mothers.

All mothers talked about time, or lack of time in their daily lives. Using formal services to release some time for mothers reinforced the impracticability and inflexibility of family services who appeared to deal in portions of time and had little perception of the demands on every day living. The freed time was also a reminder for mothers that they were parents without a separate identity and subject to the control of others. This echoes the work of Becker and Greer (1960) on latent identities and how social constraints form identities which become more apparent when others bring them into play. This then returns to the work of Phoenix and co-workers (1991) on normative expectations around responsibility and the 'good enough' mother, and some mothers felt trapped by their expected role. However, some mothers actively challenged societal notions of the 'good enough' mother by their cognitive appraisal of mothering as a 'job' which like all jobs has differing levels of satisfaction and frustrations. This perception enabled them to develop resilience.

All mothers espoused the need for practical and emotional support, either from immediate family or extended support systems that could be formal or informal. Being a lone parent was not necessarily seen as being problematic for some mothers who appeared to develop more effective and positive relationships when they lived apart from their partners. This does not support earlier findings that lone carers have to rely more on individual / cognitive coping strategies (Grant and Whittell, 2000). However, it has to be noted that this was only an exploratory study and more in depth research with mothers and fathers / partners may provide a comprehensive view of the differing contexts.

Expectations were mentioned as a way of developing resilience and supports earlier work that proposes that with age comes a greater level of resourcefulness and older parents especially viewed this in terms of expectations and the ability to adapt with greater ease because of greater levels of life experience. Parents also

commented on how a second or third child with disabilities fitted into their existing families with greater ease because they had to, rather than a first child. This does not suggest that life was easier for these parents, rather it suggests that they had internalised normative expectations of being a family. Comparison was one way in which mothers developed resilience, although there were echoes of being a competent parent which was first developed by Voysey (1972). Initially, they felt that the public appearance of members of their family was evidence of a family's private state and the appearance or behaviour of one member may reflect on the rest of the family. Managing a performance of being a competent parent in the public sphere and being open to judgement and scrutiny from others may prove to be daunting for some parents and lead to limited social action and withdrawal, which has also been identified as one factor in mothers receiving a diagnosis of post natal depression (Mauthner, 1995, 2002; Nicolson, 1998). However, the present study indicated that social withdrawal is one factor that gave mothers time to reflect and develop resilience, enabling them to challenge normative societal perceptions. Comparison with others felt to be less fortunate than themselves was also a positive way of developing resilience, but simultaneously there was a tension between 'fitting in' and accepting difference.

Collective coping for the purposes of the present study involves the function of a group, community or service to enable the development of resilience. A sense of belonging to a community was important for these mothers, as was being with peer groups which facilitated a form of social debriefing where the mothers could discuss their thoughts, feelings, and fears with like minded others. Previous research has identified that mothers benefit from peer support with similar others which provided emotional support, resolution of difficult feelings, practical advice, and experiential learning (Kerr and McIntosh, 2000), which could not be obtained from health care professionals. What was also apparent with support from other parents with children with disabilities was the 'normalising' effect it had on mothers making them feel not so different and being able to reappraise their own situation in more positive terms. However, there were some mothers who did not wish to engage with other groups because they preferred to manage independently. Problem focused coping is usually, although not exclusively, a task oriented way of enabling individuals to develop greater resilience and control over situations that may cause distress. It does not occur in isolation from the other domains of coping, but separating it may help to identify and suggest ways in which health

care services may enable mothers. For example, an assessment that gave mothers a sense of direction and an idea of what to expect was important for these mothers. Gatekeepers to health and social services were reported as being the liaison nurses who could unknowingly enable or disable mothers with access to information. Using a website, which was constantly updated for both professional and parental access to information, was one way suggested by parents as an impartial way of supporting parents and enabling them to gain greater control over their everyday lives. Another suggestion was informal support groups such as drop-in sessions that parents could choose to access when they felt able. Parents spoke about being able to control the amount of information that was offered so they could take their time to think and access as much, or as little as they wanted. Information overload was seen as reducing coping, not as a way of enabling mothers. Mothers felt that more attention to the structure of services was important by service providers and a greater level of co-ordination and liaison within and between services was essential. Mothers were aware of role conflict from services providers, which moderated their expectations but did not alleviate their frustrations.

In relation to oral health, although not explicitly mentioned, it became more and more apparent from mothers experiences and discussions that informal peer support and parent led support in partnership with professionals, was an ideal arena for the transmission of shared information. Moreover, a central area of regularly updated information needed developing which was accessible to parents when and how they wished, and which had regular parental input so that they could share their tips and experiences with other parents as a forum for shared learning. Building oral health into this concept and making it a part of general health and part of everyday life for parents is proposed as an enabling way of building an effective and sustainable way of promoting oral health and for parents to take control of their child's wellbeing at a time when they feel they have the capacity to choose and decide and therefore develop resilience.

5.3.2 Non-Response / Non-Participation Analysis

In order to investigate barriers to participation in the present study, qualitative research methods were employed because they provide valuable insights into the perspectives of the study population and their difficulties in participating in the study. All parents / caregivers of pre-school children with disabilities registered

with Enable Ireland but who decided not to consent to participation in the present study were invited to participate in the non-response analysis. All participating parents in the non-response analysis identified the demands on their resources as the main obstacle. Parents of children with disabilities experience a financial impact when they have a child with disabilities (Dowling and Dolan, 2001). For example, parents may find it harder to maintain full-time employment, or their housing may be inadequate for their child's needs and spending on basic needs may increase, leaving parents struggling to meet the level of debt incurred (Emerson and Hatton, 2007). Other studies have identified that parents of children with disabilities spend twice as much as parents of children without disabilities on items and services for their child (Dobson et al., 2001). In addition to the worry concerning finances, parents of children with disabilities in the present study expressed a lack of support at a time of transition when, depending on the level of impairment, they were dealing with health care services in order to obtain medical, child developmental and family support for their child, and feeling isolated and marginalised as a result of social attitudes (Dobson et al., 2001). Other worrying factors may be related to the diagnosis, or lack of one. Receiving a diagnosis is often the point from which parents can begin to regain some control, start to think about their futures, and gain an insight into the nature of their child's disability.

Several parents pointed out that accessing services proved to be problematic and parents engaged in a struggle in order to obtain services for their child (Greco et al., 2004). There may also be problems with physically accessing services due to their geographical location and transport restrictions (Smith et al., 1990). Despite the importance of oral health in terms of a whole person approach, it may be that because of the multitude of barriers in their lives parents have tendencies to place oral health quite low on their list of priorities for their child and therefore decided not to participate in the present study.

Chapter 6 Conclusions

The experience gained with the secure online data collection system demonstrated that such a data collection system has been successfully developed and its use implemented. The achieved high levels of data protection and security, paired with a very low risk of collecting inaccurate information, resulted in high quality and readily available data for analysis.

Evaluation of participation levels in the present study and comparison of these findings with previously published data may indicate that the overall registration level in the present study is close to the actual population incidence rate of disabilities in pre-school children.

The Small Area Health Research Unit (SAHRU) Deprivation Index was used as an indicator as to whether families of pre-school children with disabilities reside in an area considered to be materially disadvantaged. This indicator was used as a proxy measure for material deprivation of the family. The application of the SAHRU Deprivation Index demonstrated no statistically significant difference in deprivation scores between the two sample populations in the HSE North-East and HSE South-East. Both sample populations were identified to have a similar deprivation score, which was in the 7th decile of the SAHRU Deprivation Index.

This study demonstrated that pre-school children with disabilities residing in the HSE North-East and HSE South-East had no evidence of dental caries in the first three years of their lives.

The analysis of the data demonstrated that the occurrence of dental caries in the sample population was not linked to their family's deprivation status, which was defined by the level of material deprivation of the electoral division (ED) of residence. This suggests that any preventive intervention for pre-school children with disabilities should benefit all children equally. Identification of children with a socially disadvantaged background and using this indicator as a sole maker to prioritise services may not yield any substantial dental health improvements in this section of the child population.

Dental caries was first observed in four-year-old children and caries levels gradually increased in the older age groups. Comparison of the dmft scores between children aged three years or younger, four to six year olds and children aged seven years or older at baseline showed that the dmft distribution differed markedly in the oldest age group from the other two age groups.

Comparison of dmft baseline scores between children with a cognitive disability and children with a non-cognitive disability demonstrated that dental caries prevalence in children with a cognitive disability differed markedly from children with a non-cognitive disability in the HSE North-East. This distribution pattern was not apparent in the HSE South-East. In the HSE North-East at baseline approximately eighty-five percent of the children with a cognitive disability were caries-free compared with children in the South-East where approximately seventy-seven percent of the children with cognitive disability were caries-free. In the HSE North-East at baseline, all children with a non-cognitive disability were caries-free whereas in the HSE South-East approximately eighty percent of the children with a non-cognitive disability were caries-free.

In order to examine the development of dental health patterns over time, a subgroup of participants was selected that consisted of children who were examined at baseline and who attended the second examination as well. The dental caries levels at baseline in this subgroup of children appeared not to differ from the whole sample and therefore may represent the whole baseline sample. Comparison of dental caries prevalence in these children, between HSE North-East and HSE South-East, did not demonstrate any difference between the two groups at baseline.

In the HSE North-East (intervention group), a longitudinal comparison of the dental caries prevalence between baseline results and the second examination results (approximately one year later) in the same children, revealed a non statistically significant change in dental caries prevalence.

In the HSE South-East (control group), longitudinal comparison of the dental caries prevalence between baseline results and the second examination results (approximately one year later), in the same children, revealed a statistically significant increase in dental caries prevalence.

Further longitudinal comparison of the dental caries levels between second examination results and the third examination results (approximately another year later) in the same children revealed a statistically significant increase in dental caries levels in the HSE South-East (control group). No such analysis was undertaken for the HSE North-East, because too few children attended the third examination in the HSE North-East before the cut-off date for the present analysis.

Comparison of dental caries prevalence between pre-school children with disabilities residing in fluoridated communities and children who live in homes not connected to the public water supply demonstrated no statistically significant difference in dental caries levels between the two groups in each of the two regions.

The analysis of aggregated DDE scores between children who consumed fluoridated water and children who consumed non-fluoridated water demonstrated non-significant differences between the two groups in the HSE North-East and HSE South-East.

The analysis of the oral hygiene assessment revealed that the need for 'urgent referral', which was defined as a condition when irreversible damage of periodontal tissues was likely to occur, was deemed to be rarely needed in either of the two regions.

The baseline oral hygiene assessment demonstrated that the percentage of children considered to have excellent oral hygiene was higher in the HSE South-East when compared with the results for the HSE North-East. Detailed examination of the results showed that this difference was particularly pronounced at baseline in children aged between four to six years.
This trend of a disparity in oral hygiene levels persists in the longitudinal analysis with no apparent improvement in oral hygiene levels in the HSE North-East. Furthermore, comparison of the baseline and second examination results demonstrated that more children with a cognitive disability were considered to require oral hygiene instruction and/or some form periodontal health related treatment at the second examination in the HSE North-East.

The present study assessed the prevalence of erosion in pre-school children with disabilities. The occlusal surfaces of the second primary molar teeth or the first permanent molar teeth and the labial and palatal surfaces of the incisor teeth were assessed for loss of surface enamel characteristics, and / or exposure of dentine or pulp. The present study found that there was a regional variation in the prevalence of dental erosion in the sample population. However, these findings are in the range of previously published international epidemiological research data in this age group of children.

Analysis of the questionnaire data revealed that parents / caregivers of pre-school children with disabilities had a high level of basic dental health knowledge in both regions at baseline with a slightly higher knowledge base in the HSE South-East. These high levels of dental health knowledge are encouraging as it indicates that parents / caregivers are recalling general dental health advice. The overall levels of dental health knowledge did not change in the HSE North-East (intervention group) over the observation period. A reorientation of current oral health education practice may yield some measurable change in dental health behaviour.

The provision of oral health education and/or preventive treatment depending on the outcome of a comprehensive assessment was part of the oral disease prevention programme in the HSE North-East. Approximately eighty percent of the children examined at baseline were considered to require parental oral health education and/or preventive treatment.

A comprehensive dental health risk assessment was conducted as part of the referral process, in order to determine the quality and urgency of referral. The medical history was considered a low dental health risk in the majority of children, whereas the fluoride toothpaste status and dietary habits demonstrated a medium or high dental health risk in the majority of children.

Analysis of the referral forms demonstrated that the majority of referrals went to the oral health promotion (OHP) team, i.e. examiners concluded that the majority of patients would benefit most from services provided by the OHP team (i.e. oral health education and diet counselling for parents / caregivers) in order to improve

the child's oral health. Furthermore, more than half of all assessed children were considered to benefit from additional treatment provided by dental hygienists as well (such as plaque and calculus removal).

Analysis of the emergent data from the focus groups, to explore the coping strategies of parents with children with disabilities, suggested that mothers used a variety of problem-solving, individual and collective coping strategies that enabled coping and the development of resilience. All mothers talked about time or lack of time in their daily lives and emphasised the need for both practical and emotional support. There were many ways in which mothers developed resilience: from redefining and managing their expectations to comparison with others in a similar situation. However, collective coping was one area that received a great deal of discussion and parents felt that they learnt a great deal from one another, but wanted more professional input and an arena where they could choose when and how much information to access. Information overload was seen as reducing coping, not as a way of enabling mothers.

Using a continuously updated website for the flow of information and communication between professional, parents / caregivers, support groups and other services was one way suggested by parents as an impartial way of supporting parents and enabling them to gain greater control over their everyday lives.

Another suggestion was informal support groups such as drop-in sessions that parents could choose to access when they feel able.

Oral health was not explicitly mentioned by mothers but what became apparent from the focus groups was that informal peer support and parent led support in partnership with professionals, was an ideal platform for the transmission of shared information. Furthermore, the need to develop a central access point with regularly updated information, which is accessible to parents when and how they wish, was suggested. This peer-support should have a regular parental input so that they could share their tips and experiences with other parents as a forum for shared learning. Building oral health into this platform and making it a part of general health and part of everyday life for parents has been proposed as an

enabling way of building an effective and sustainable way of promoting oral health and for parents to take control of their child's wellbeing.

All participating parents at the non-response analysis identified the demands on their resources as the main obstacle. Oral health care was generally a low priority for them and participation in an oral health care research, project without immediate gain, was out of the question because of these competing daily demands. Furthermore, confidence appeared to be an issue, which may constrain parents from attendance, perhaps fears concerning devaluing of their personal experiences by other non-dental professionals.

The daily demands of caring for a child with disabilities means that most parents are tied to a day-to-day routine and the greater the level of impairment, the higher the number of demands. These daily demands made the invitation to a dental examination as part of the present research project a low priority.

Chapter 7 Recommendations

The evidence from this study indicates the need for a clear policy to recommend the use of fluoridated toothpaste with a fluoride concentration of 1000/1100 ppm F when the first teeth appear in the oral cavity and not to wait to use fluoridated toothpaste until the child has reached the age of two, in order to reduce the risk of developing dental caries in pre-school children with disabilities as a group.

Alternative and additional ways of providing an optimal supply of topical fluoride in young children with disabilities at risk of developing dental caries include the application of slow-release fluoride devices and the use of fluoride varnish. The development of a pilot programme to educate dental nurses and health care practitioners other than oral health professionals, to apply fluoride varnish after prescription by a dental surgeon, should be explored. This education programme needs to ensure that these dental nurses and non-dental health care practitioners are appropriately trained and competent.

The evidence from the present study indicates the need for a revised, evidence based policy for pre-school children with disabilities for the application of fissure sealants. Occlusal surfaces of permanent teeth should be sealed as soon as they appear in the oral cavity. This policy must embrace workable clinical criteria in targeting patients for fissure sealants.

Given the considerable resources involved in providing routine scale and polish treatments it can be agued that this treatment should only be routinely provided to young children if sufficient home-care plaque control will be available or/and additional preventive treatments, such as the application of fissure sealants or/and the application of fluoride varnish, will follow the removal of dental plaque and calculus. Scaling and polishing of the teeth in pre-school children with disabilities as a stand-alone measure appeared to have a limited, sustainable affect on the dental health.

The current, paternalistic approach of oral health education should be developed to an adapted motivational interviewing approach.

The evidence from this study would support the development of an informal peer and parent-led, support project in partnership with professionals, in order to transmit shared information with regular parental input so that they can share their tips and experiences with other parents in a forum of shared learning. This parent-led support project should make oral health a part of general health and part of everyday life for parents and children.

The findings from the present study would support the development of a continuously updated website or 'clearing house' for the flow of information on quality oral health and communication between professional, parents / caregivers, support groups and other services. This website should provide an impartial way of supporting parents / caregivers and enabling them to gain greater control over their everyday lives.

In order to gain further insight into the development of oral health in young children with disabilities over time, the present database should be maintained and data collection should be continued by use of a dedicated oral health monitoring programme. This oral health monitoring programme in young children with disabilities should continue to examine young children with disabilities at annual intervals and audit the implementation of the recommendation of the present study. In order to ensure high levels of participation and ease pressure expressed in the non-response analysis, the offer of home visits should be explored.

Chapter 8 References

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Appendix A: Supplementary Results

Supplementary Tables:

Appendix A: Table 4.22: Baseline Range Of Dental Caries (dmft) In 2nd Examination Attendees In The HSE North-East Stratified By Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	38	100	11	100	17	85.0	11	68.8	2	66.7	1	25.0
1	--	--	--	--	1	5.0	3	18.8	--	--	--	--
2	--	--	--	--	--	--	1	6.3	--	--	1	25.0
3	--	--	--	--	--	--	--	--	--	--	1	25.0
4	--	--	--	--	2	10.0	--	--	--	--	--	--
5	--	--	--	--	--	--	1	6.3	--	--	1	25.0
6	--	--	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	1	33.3	--	--
8	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.23: Baseline Range Of Dental Caries (dmft) In 2nd Examination Attendees In The HSE South-East Stratified By Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	7	100	10	100	14	93.3	12	70.6	14	66.7	15	79.0
1	--	--	--	--	--	--	1	5.9	3	14.3	2	10.5
2	--	--	--	--	--	--	1	5.9	1	4.8	2	10.5
3	--	--	--	--	1	6.7	--	--	1	4.8	--	--
4	--	--	--	--	--	--	2	11.8	--	--	--	--
5	--	--	--	--	--	--	--	--	1	4.8	--	--
6	--	--	--	--	--	--	1	5.9	1	4.8	--	--
7	--	--	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.27: Baseline Range Of Dental Caries (dmft) In 2nd Examination Attendees In The HSE North-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	56	84.8	6	100.0	16	88.9	2	100.0	1	100.0
1	3	4.5	--	--	1	5.6	--	--	--	--
2	2	3.0	--	--	--	--	--	--	--	--
3	1	1.5	--	--	--	--	--	--	--	--
4	2	3.0	--	--	--	--	--	--	--	--
5	1	1.5	--	--	1	5.6	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	1	1.5	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.28: Baseline Range Of Dental Caries (dmft) In 2nd Examination Attendees In The HSE South-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	53	80.3	9	90.0	2	66.7	5	83.3	3	75.0
1	5	7.6	--	--	--	--	--	--	1	25.0
2	2	3.0	--	--	1	33.3	1	16.7	--	--
3	2	3.0	--	--	--	--	--	--	--	--
4	2	3.0	--	--	--	--	--	--	--	--
5	--	--	1	10.0	--	--	--	--	--	--
6	2	3.0	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.32: 2nd Examination Range Of Dental Caries (dmft) In The HSE North-East Stratified By Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	22	100	9	90	8	88.9	9	90	12	75	13	59.1
1	--	--	--	--	1	11.1	1	10	--	--	1	4.5
2	--	--	1	10	--	--	--	--	4	25	3	13.6
3	--	--	--	--	--	--	--	--	--	--	3	13.6
4	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	1	4.5
6	--	--	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--	1	4.5
8	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.33: 2nd Examination Range Of Dental Caries (dmft) In The HSE South-East Stratified By Age

	Age											
	≤2		3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	1	100	4	80	7	87.5	10	71.4	9	56.3	26	70.3
1	--	--	1	20	1	12.5	3	21.4	1	6.3	6	16.2
2	--	--	--	--	--	--	--	--	1	6.3	1	2.7
3	--	--	--	--	--	--	1	7.1	1	6.3	1	2.7
4	--	--	--	--	--	--	--	--	1	6.3	1	2.7
5	--	--	--	--	--	--	--	--	1	6.3	--	--
6	--	--	--	--	--	--	--	--	--	--	1	2.7
7	--	--	--	--	--	--	--	--	1	6.3	--	--
8	--	--	--	--	--	--	--	--	--	--	1	2.7
9	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--	1	6.3	--	--

Appendix A: Table 4.38: 2nd Examination Range Of Dental Caries (dmft) In The HSE North-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	51	77.3	6	100	17	94.4	2	100	1	100
1	3	4.5	--	--	--	--	--	--	--	--
2	7	10.6	--	--	1	5.6	--	--	--	--
3	3	4.5	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	1	1.5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	1	1.5	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.39: 2nd Examination Range Of Dental Caries (dmft) In The HSE South-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	48	72.7	9	90.0	2	66.7	2	33.3	2	50.0
1	6	9.1	1	10.0	1	33.3	3	50.0	2	50.0
2	2	3.0	--	--	--	--	1	16.7	--	--
3	4	6.1	--	--	--	--	--	--	--	--
4	2	3.0	--	--	--	--	--	--	--	--
5	1	1.5	--	--	--	--	--	--	--	--
6	1	1.5	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	1	1.5	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--
11	1	1.5	--	--	--	--	--	--	--	--

Appendix A: Table 4.46: 2nd Examination Range Of Dental Caries (dmft) In 3rd Examination Attendees In The HSE North-East Stratified By Age

	Age									
	≤3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	7	100	3	75	--	--	1	100	3	100
1	--	--	1	25	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.47: 2nd Examination Range Of Dental Caries (dmft) In 3rd Examination Attendees In The HSE South-East Stratified By Age

	Age									
	≤3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	3	75	4	80	8	80	4	44.4	12	80
1	1	25	1	20	2	20	1	11.1	1	6.7
2	--	--	--	--	--	--	1	11.1	--	--
3	--	--	--	--	--	--	1	11.1	1	6.7
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	1	6.7
7	--	--	--	--	--	--	1	11.1	--	--
8	--	--	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	1	11.1	--	--

Appendix A: Table 4.51: 2nd Examination Range Of Dental Caries (dmft) In 3rd Examination Attendees In The North-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	9	90.0	1	100	4	100	--	--	--	--
1	1	10.0	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.52: 2nd Examination Range Of Dental Caries (dmft) In 3rd Examination Attendees In The South-East Stratified By Disability

	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	26	74.3	7	100	1	50.0	--	--	--	--
1	4	11.4	--	--	--	--	2	100	--	--
2	1	2.9	--	--	--	--	--	--	--	--
3	2	5.7	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	1	2.9	--	--	--	--	--	--	--	--
7	--	--	--	--	1	50.0	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--
11	1	2.9	--	--	--	--	--	--	--	--

Appendix A: Table 4.56: 3rd Examination Range Of Dental Caries (dmft) In The HSE North-East Stratified By Age

	Age									
	≤3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	6	100	4	100	2	66.7	1	100	2	100
1	--	--	--	--	1	33.3	--	--	--	--
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.57: 3rd Examination Range Of Dental Caries (dmft) In The HSE South-East Stratified By Age

	Age									
	≤3		4		5		6		≥7	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	2	100	3	100	7	100	8	61.5	15	78.9
1	--	--	--	--	--	--	1	7.7	2	10.5
2	--	--	--	--	--	--	--	--	1	5.3
3	--	--	--	--	--	--	2	15.4	--	--
4	--	--	--	--	--	--	--	--	1	5.3
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	1	7.7	--	--
7	--	--	--	--	--	--	1	7.7	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.61: 3rd Examination Range Of Dental Caries (dmft) In The HSE North-East Stratified By Disability

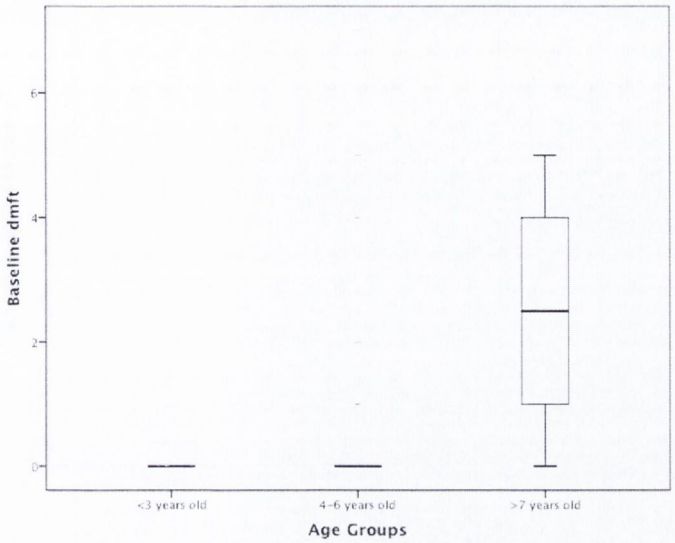
	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	9	90.0	1	100	4	100	--	--	--	--
1	1	10.0	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Appendix A: Table 4.62: 3rd Examination Range Of Dental Caries (dmft): HSE South-East Stratified By Disability

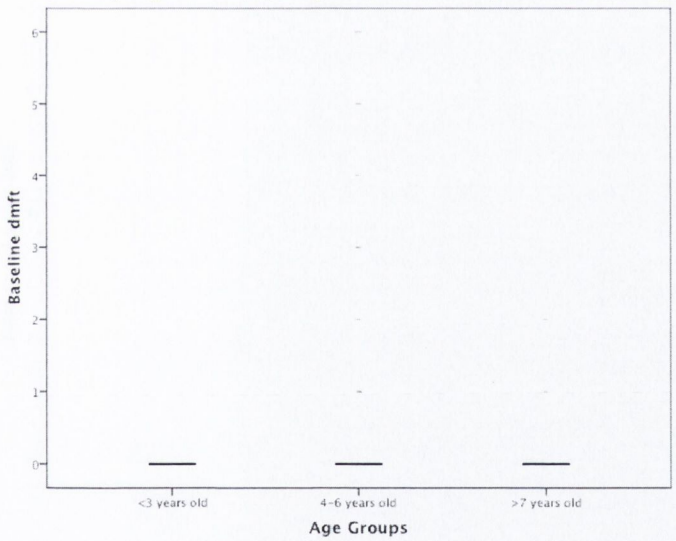
	Cognitive		Physical		Cognitive & Medically		Medically Compromised		Not Diagnosed	
dmft	No.	%	No.	%	No.	%	No.	%	No.	%
0	27	77.1	7	100	1	50.0	2	100	--	--
1	3	8.6	--	--	--	--	--	--	--	--
2	1	2.9	--	--	--	--	--	--	--	--
3	2	5.7	--	--	--	--	--	--	--	--
4	1	2.9	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	1	2.9	--	--	--	--	--	--	--	--
7	--	--	--	--	1	50.0	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--

Supplementary Figures:

Appendix A: Figure 4.7: Boxplot Of Baseline dmft Distribution In 2nd Examination Attendees Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE North-East



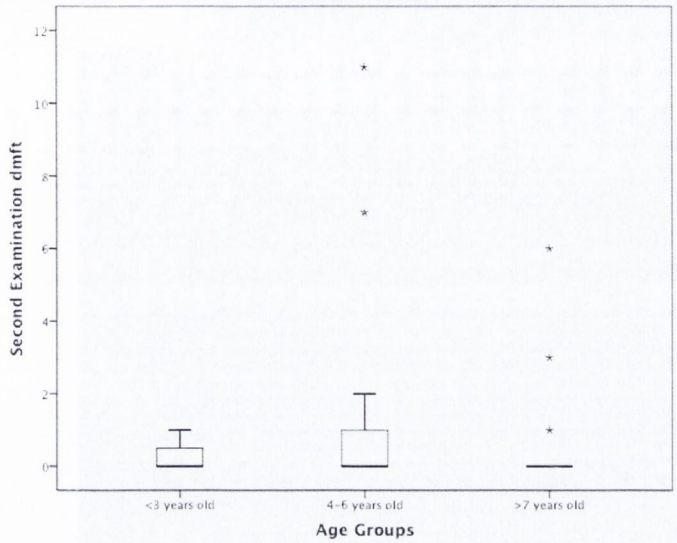
Appendix A: Figure 4.8: Boxplot Of Baseline dmft Distribution In 2nd Examination Attendees Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE South-East



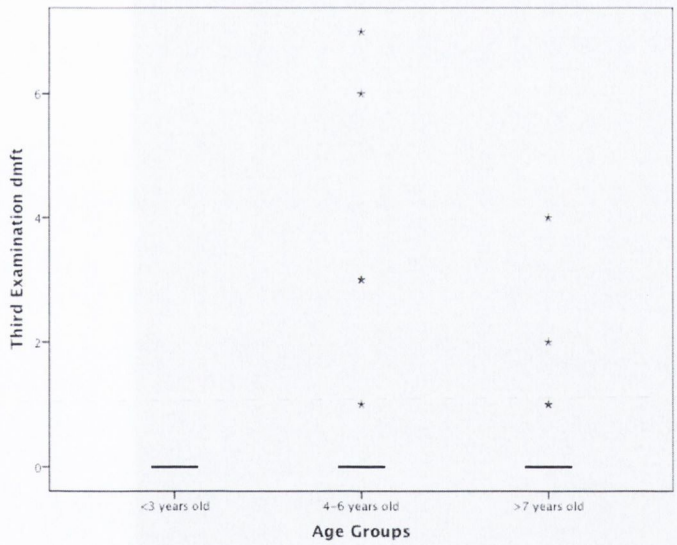
Appendix A: Figure 4.9: Boxplot Of Second Examination dmft Distribution Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE North-East

Appendix A: Figure 4.10: Boxplot Of Second Examination dmft Distribution Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE South-East

Appendix A: Figure 4.11: Boxplot Of Second Examination dmft Distribution In 3rd Examination Attendeed Stratified By Age Groups ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE South-East

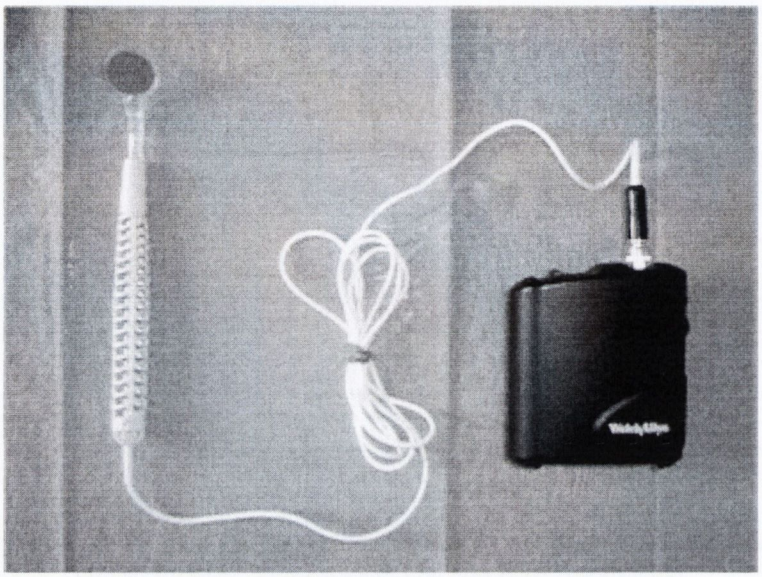


Appendix A: Figure 4.12: Boxplot Of Third Examination dmft Distribution Stratified By Age Group ('≤3-year-olds', '4-6-year-olds', '≥7-year-olds') In The HSE South-East



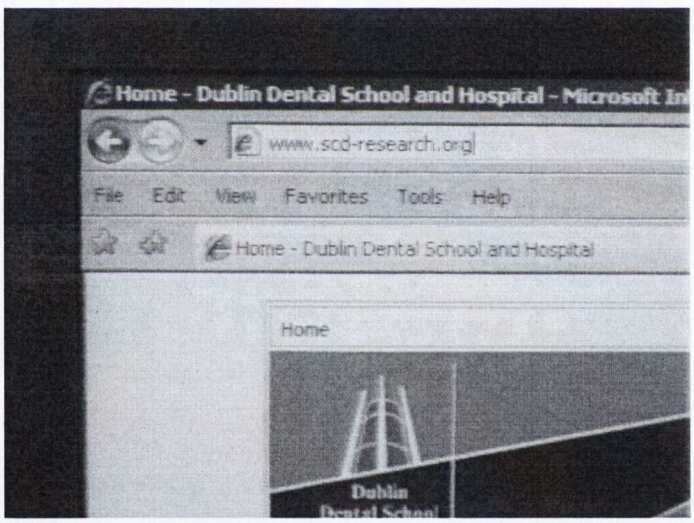
Appendix B: Equipment Used in the Study

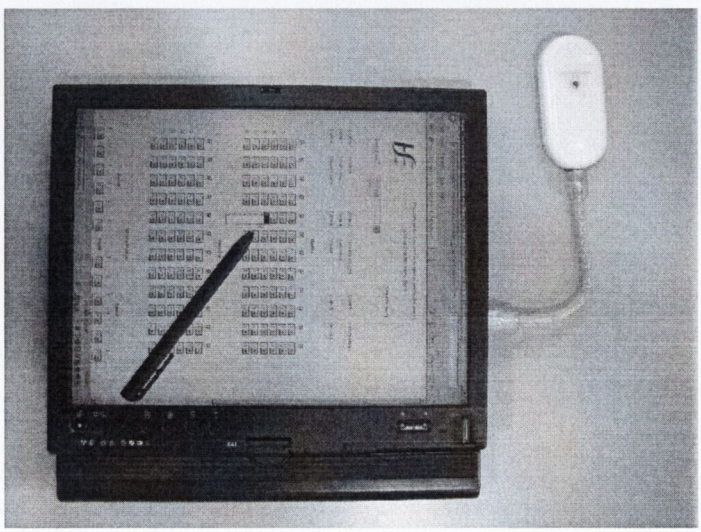
Plain mouth mirror with a fibre-optic light (DenLite)



Producer:	Welch Allyn Ltd., Navan, Co. Meath, Ireland	
Hand piece:	Order number:	DP 1550
Rechargeable Battery:	Order number:	DP 1545
Recharger (Europe):	Order number:	DP 1540-2
Mirror head:	Order number:	DP 1030

Tablet-PC to enter and submit clinical oral health and questionnaire data





Appendix C: Caregivers' Questionnaire

Questionnaire

01 Putting a child to bed with milk in a bottle can cause tooth decay.
(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

02 Putting a child to bed with juice in a bottle can cause tooth decay.
(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

03 If a child has a bag of sweets, do you think it would be better for his/her teeth to:
(Please tick ☑ all that apply)

1☐ Eat them all in one go
2☐ Have a few now and then and save the rest for later
3☐ Don't Know

04 'Tooth brushing prevents tooth decay'
(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

05 'You should brush your child's teeth after each meal to prevent decay'
(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

06 Fruit drinks designed especially for children are safe for teeth.
(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

07 Most medicines are sugar-free.

(Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

08 Fluoridation of drinking water will decrease the amount of tooth decay in children. (Please tick ☑ one box only)

1☐ True
2☐ False
3☐ Don't Know

09 At what age do you think that you should start to brush children's teeth?
(Please tick ☑ one box only)

1☐ When teeth just come through
2☐ Less than 1 year
3☐ At 1 – 2 years
4☐ Over 2 years
5☐ Don't Know

10 How often each day should children's teeth be brushed?
(Please tick ☑ one box only)

1☐ Once
2☐ Twice
3☐ More than twice
4☐ Never
5☐ Don't Know

11 These pictures show different amount of toothpaste on a brush. Which picture shows the amount of toothpaste your child uses? *(Please tick ☑ one box only)*

1☐ My child's teeth are not usually brushed
2☐ My child does not use toothpaste
3☐ Pea-sized amount of toothpaste
4☐ Half brush of toothpaste
5☐ Full brush of toothpaste
6☐ Overflowing brush of toothpaste

11a If parent answered positively to 3,4,5 or 6 above, please ask:
What sort of toothpaste does your child use?
(Please tick ☑ the appropriate box)

1☐ Family fluoride
2☐ Child fluoride toothpaste
3☐ Non fluoride toothpaste
4☐ Don't Know
5☐ Other, please specify _____

12 Does anyone help your child to brush his / her teeth? *(Please tick ☑ one box only)*

1☐ My child brushes his / her own teeth and does not get help
2☐ Mother / Father
3☐ Brother / Sister
4☐ Guardian
5☐ Nanny / Child-minder
6☐ Other, please specify _____

Please ask the parent if they agree / disagree with the following three statements (the last two only apply to children with teeth)

13 'I think that only the dentist can prevent my child's teeth from decaying'
(Please tick ☑ one box only)

1☐ Strongly agree
2☐ Agree
3☐ Undecided
4☐ Disagree
5☐ Strongly disagree
6☐ Other, please specify _____

If the child has teeth, please ask the following two questions, if not, tick not applicable

14 'Cleaning my child's teeth is a task that I feel confident to carry out'
(Please tick ☑ one box only)

1☐ Strongly agree
2☐ Agree
3☐ Undecided
4☐ Disagree
5☐ Strongly disagree
6☐ Not applicable – no teeth yet

15 'When I brush my child's teeth, I think I do it well'
(Please tick ☑ one box only)

1☐ Strongly agree
2☐ Agree
3☐ Undecided
4☐ Disagree
5☐ Strongly disagree
6☐ Not applicable – no teeth yet

Appendix D: Data Recording Sheet

DATA RECORDING SHEET

Name of Child: _____ Date of Birth: _____

Gender: Male / Female Code: Date of Exam: / /

	UR	MAXILLA											
Tooth		6	E	D	C	B/2	A/1	A/1	B/2	C	D	E	6
Presence													
Crown Condition	O												
	M												
	B												
	D												
	P												

	LR	MANDIBLE											
Tooth		6	E	D	C	B/2	A/1	A/1	B/2	C	D	E	6
Presence													
Crown Condition	O												
	M												
	B												
	D												
	P												

EROSION OF INCISOR

	UR Finish	←	BUCCAL ←	←	UL Start	
	6	B/2	A/1	A/1	B/2	6
Depth						
Area						

	UR Finish	←	PALATAL ←	←	UL Start	
	6	B/2	A/1	A/1	B/2	6
Depth						
Area						

DEVELOPMENTAL DEFECTS OF ENAMEL (DDE)

Tooth	6	D	C	B/2	A/1	A/1	B/2	C	D	6
Type										
Extent										

TRAUMA OF INCISORS

UR	B/2	A/1		A/1	B/2	UL
	☐	☐		☐	☐	
LR	B/2	A/1		A/1	B/2	LL
	☐	☐		☐	☐	

TREATMENT NEED – PERIODONTAL

Part A: Treatment **Part B:** Need for urgent referral

☐ ☐

Appendix E: Examination Criteria

E.1 Tooth Presence

The examiner should commence examinations on the upper right, upon the call of the upper right E (or 6) by the recorder. He / she should call the status for each tooth or space following the recorder's call from the upper right E (or 6) continuing to the upper left E (or 6). The examiner should then call the status for each lower tooth or space beginning at the lower right E (or 6) and proceed to the lower left E (or 6). It should be noted that although the FDI international system of numbering teeth has been used, the recorder may call A, B, C etc. to retain simplicity without causing confusion. The examiner may have to use clinical judgment regarding tooth morphology, and take into account the subjects previous dental history if doubt exists as to the correct notation of a particular tooth.

Tooth Status Code	
1	primary or permanent tooth present
0	primary or permanent tooth absent

E.2 Crown Status

Preface to Surface Conditions Coding

A condition code will be given to each surface of each tooth present. The crown has 4 surfaces; mesial, distal, buccal and lingual, in the case of incisors and canines. Molar teeth have an extra surface (occlusal). It will be noted, some tooth codes exclude a need for surface condition coding e.g. if a tooth has been extracted or is congenitally missing the surface condition code will be left blank. In the case of a partially erupted tooth, score all surfaces present and sound unless there is caries on the erupted portion.

Caries

The examination for caries is largely a visual one. The teeth are examined wet and a CPITN probe is used to remove food debris. The CPITN probe may also be used to confirm cavitation.

Code 0 No Caries

A surface should be considered sound if it shows no evidence of treated or untreated caries, or if it is at the doubtful stage. These scores will also apply in the case of defects not to be counted as caries:

- white and / or chalky spots;
- discoloured or rough spots;
- stained pits or fissures in the enamel that catch the explorer but do not have a detectably softened floor, visibly undermined enamel or softening of the walls;
- Dark, shiny, hard pitted area of enamel in a tooth showing signs of moderate to severe fluorosis.

Code 1 Visual Caries

Visual caries is recorded when there is definite evidence of caries into dentine, but where there is no probable cavity through the enamel. The appearance may vary but will usually look like grey or creamy white shadowing under enamel. Where there is any doubt score sound.

Code 2 Decayed, Cavity

Caries will be considered to be present in a surface when any lesion has detectably softened floor, undermined enamel, or softened wall. On an approximal surface, the lesion must be visible and the probe point must enter a lesion with certainty. Where any doubt exists, caries should not be diagnosed as being present. It must be emphasized that clinical caries is a stage in the process of dental caries. Dental caries precedes from a microscopic lesion, which cannot be diagnosed by clinical examination. The upper limit for this category is the complete destruction of the crown. Where only roots remain for deciduous teeth, decayed is recorded only when no permanent successor has erupted.

Dental caries affecting enamel only, such as white spot lesions and other conditions similar to the early stages of caries should be deliberately excluded because they cannot be diagnosed positively and reliably.

Decayed is recorded where a surface contains a temporary filling requiring further treatment, or where a complete filling is lost. For a primary surface, decayed is recorded even though it is about to be exfoliated.

Code 3 Filled and Decayed

A surface should be classified filled and decayed when a surface has been filled or crowned (stainless steel) and another area is carious or if there is recurrent caries in contact with a filling.

Code 4 Restoration

Surfaces should be considered filled whenever a filling or any permanent material is present (including stainless steel crowns) and there is no discrete or recurrent caries. A defective filling where there is no discrete or recurrent caries e.g. cracked or partly missing is scored code 3.

Code 5 Trauma

A surface should be recorded 'trauma' if part of its substance is missing for reasons other than treated or untreated caries and the latter condition is not present. Code 5 is the score for all surfaces where a crown is present due to trauma.

Code 6 Fissure Sealant

A fissure sealant is recorded to be present when it is detectable on a surface and when there is no probable caries on the same surface.

Code 9 Excluded

This category should be used for teeth, which cannot be properly examined (i.e. impacted teeth or teeth which have been banded for orthodontic reasons).

E.3 Dental Erosion

The occlusal surfaces of the index teeth and the labial and palatal surfaces of the incisor teeth will be assessed for loss of surface enamel characteristics, and / or exposure of dentine or pulp. (DO NOT code the incisal edge).

The examination will be carried out on the following teeth:

E	BA	AB	E

or

6	21	12	6

Assess the Depth and Area of loss of tooth tissue for each surface using the following criteria:

Code	Depth
0	Normal
1	*Enamel only* – on incisor teeth there is loss of developmental ridges resulting in a smooth, glazed or 'ground glass' appearance. On occlusal surfaces the cusps appear rounded and there may be depressions producing 'cupping'.
2	*Enamel and dentine* – there is a loss of enamel exposing dentine. On incisors this may resemble a 'shoulder preparation' parallel to the crest of the gingivae, particularly on palatal surfaces. The incisors may appear shorter and there may be chipping of the c=incisal edges. On occlusal surfaces 'cupping' and rounding-off of cusps is evident. Restorations may be raised above the level of the adjacent tooth surface.
3	*Enamel, dentine and pulp* – loss of enamel and dentine resulting in pulpal exposure.
9	Assessment cannot be made.

Erosion should be distinguished from attrition and abrasion on the basis of the following:

Attrition usually occurs on occlusal surfaces, incisal edges, the palatal surfaces of upper anterior teeth and the labial surfaces of lower anterior teeth. The teeth appear faceted and the location of these facets can be elated to functional movements of the dentition. Occlusal surfaces may be flattened with an even loss of tooth substance from the marginal ridges as well as the remainder of the surface.

Abrasion is characterized by a rounded or v-shaped groove between the gingivae and the enamel at the necks of teeth. The depth of these lesions may exceed their breadth, unlike erosion lesions in the cervical area where breadth greatly exceeds depth.

Code	Area (assessed for each affected surface)
0	Normal
1	Less than one third of surface involved
2	One third – up to two thirds of surface involved
3	Two thirds or more of surface involved
9	Assessment cannot be made

E.4 Development Defects of Enamel (DDE index)

The index tooth surfaces to be examined are the labial surfaces of the maxillary permanent or primary canine and incisor teeth and the buccal surfaces of the 1st permanent maxillary molar teeth. Three basic defects are recorded, demarcated opacities, diffuse opacities and hypoplastic defects. If any defects do not fall into these categories they should be scored as other defects. The extent of defect is measured in aggregated units. The codes for type and extent of defects are as follows:

Code	Type of Defect
0	Normal
1	Demarcated opacity
2	Diffuse opacity
3	Hypoplasia
4	Demarcated + Diffuse
5	Demarcated + Hypoplastic
6	Diffuse + Hypoplastic
7	All 3
8	Other
9	Excluded

Code	Extent of Defect
0	Norma
1	<1/3
2	At least 1/3 < 2/3
	At least 2/3

Clinical Examination

Teeth will not be cleaned prior to the examination except for the removal of food debris with a tissue if necessary. Natural light will be used to examine the upper index teeth. The subject should be examined in the upright position, with the examiner facing the subject with his or her back to the light (window). Artificial light (DenLite) must be used to examine the lower permanent 1st molar teeth (if present). These teeth are examined with the subject in the supine position. When inspecting the teeth, the examiner should move their line of vision around. This approach will help to overcome the variability in recording due to angle of inspection and specular reflection. The teeth will be examined wet at the time of examination. This approach allows recording of the usual appearance of the teeth.

The recorder will initiate the examination by calling out first tooth and the surface to be examined, i.e. 'upper right maxillary primary incisor'. The designated surface of the index tooth should be inspected visually for defects. If a hypoplastic area appears to be present it should be tactilely explored with a probe to confirm the abnormality of enamel contour. Diagnosis will usually be readily evident where a defect is obvious. However, in other instances the most difficult decision will be whether or not an abnormality is present, i.e. the examiner may be unsure whether the enamel is defective or fully within the range of normal. When in doubt the tooth surface should be scored normal. Similarly where defects are obviously not

developmental in origin, i.e. white spot caries, they should be scored normal. Where an abnormality is obviously present but cannot readily be classified into one of the listed categories of defects, it should be scored 'other' defect. Disregard any single defect on a surface, which is less than 1mm at its greatest width. However, record defects whose total greatest width is greater than 1mm.

Definition of terms used in DDE Index

Opacity is defined as a qualitative defect of enamel identified visually as an abnormality in the translucency of enamel. It is characterized by a white or discoloured (cream, brown, yellow) area but in all cases the enamel surface is smooth and the thickness of enamel is normal, except in some instances when associated with hypoplasia.

Code 1 Demarcated Opacity

An opacity well demarcated from the adjacent normal enamel. It may be white, cream or yellow / brown in colour.

Code 2 Diffuse Opacity

Irregular cloudy areas of opacity lacking well-defined margins or fine white distinct lines of opacity which follow the pattern of the perikymata. Confluence of adjacent lines may be observed.

Code 3 Hypoplasia

Hypoplasia is defined as a quantitative defect of enamel visually and morphologically identified as involving the surface of the enamel (en external defect) and associated with a reduced thickness of enamel. The defective enamel may occur as (a) shallow or deep pits or rows of pits arranged horizontally in a linear fashion across the tooth surface or generally distributed over the whole or part of the enamel surface; (b) the defective enamel may occur as small or large, wide or narrow grooves; (c) in enamel over small or considerable areas of dentine. Combinations of Hypoplasia and opacities can occur on the same tooth surface (Codes 5, 6 and 7). They may be quite distinct from each other, that is, separated by normal enamel, or as a composite lesion composed of an adjacent opacity and Hypoplasia.

Code 8 Other defects

Other defects may occur which do not fulfill the specific definitions of opacity or Hypoplasia, e.g. staining: These are listed under 'Other Defects'.

Recording the Data

Defects of the same type show considerable variations and it is essential they be classified with respect to the definition of the DDE Index.

Un-erupted, missing, heavily restored, badly decayed or fractured teeth and teeth (or tooth surfaces) which for any other reason cannot be classified for defects must be coded '9'. This implies that it will be disregarded for statistical purposes.

A surface is present and examined for defects provided any part of the surface has penetrated the oral mucosa. In the case of a partially erupted tooth, score the surface present as normal unless there is a defect on the erupted portion.

If more than two defects occur on a surface, the two defects affecting the greatest area will be scored. For the 'extent' section the total area affected by all types of defects will form the basis of the assessment.

E.5 Trauma

Upper and lower permanent or primary incisors will be examined for traumatic injury. If there is injury to any incisor then identify the tooth / teeth involved and code one of the following categories for each tooth:

Code	Category
0	No evidence of trauma
1	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 has been placed to repair trauma
6	Semi-permanent restorations (treatment on-going). e.g. stainless steel crowns
7	Denture provided due to traumatic loss of this tooth
8	Enamel fracture (not restored)
9	Assessment cannot be made, there is no primary incisor present and it has not been lost due to trauma

In the case where a tooth has more than one condition / treatment, give the highest code.

Treatment code for Trauma

Following the assessment for trauma of the four primary incisors, if in the examiners opinion any of the traumatized teeth (1 or more) require treatment or further treatment because of previous trauma a code is given for the subject in the box provided.

Code	Category
0	no treatment required because of trauma; no evidence of trauma to the four primary incisors or no treatment required of any teeth that have been traumatized in the past – some cases of untreated trauma of enamel may not require treatment
1	needs treatment for some kind of dental trauma of 1 or more teeth

E.6 Oral Hygiene Assessment (Treatment Need)

- Assessment involves no probing of the gingival tissues;
- Visual inspection only;
- Examiner should examine visually all gingival tissues and assess whether they think that the subject requires any of the treatments below.

Code	Category
0	no need for treatment
1	oral hygiene instruction required
2	oral hygiene instruction required including professional removal of plaque
3	oral hygiene instruction required including professional removal of plaque and calculus
4	urgent referral required*

*Need for urgent referral for professional advice / treatment in the examiners opinion. Especially for cases where for example, urgent need for removal of gross calculus / acute gingivitis / gingival appear shiny and engorged and tendency to spontaneous bleeding / other acute conditions of the gingival and periodontal tissues

Appendix F: HSE North-East Risk Assessment and Referral Form

Assessment of Oral Health Risk Status:

	Risk level			Notesd
	High	Medium	Low	
Diagnosis / Condition	☐	☐	☐	
Medication History	☐	☐	☐	
Dietary History	☐	☐	☐	
Fluoride Toothpaste Status	☐	☐	☐	
Clinical Examination	☐	☐	☐	

Referral:

Refer for Immediate Treatment ☐ Refer To Hygienist ☐ Refer to OHP Team ☐

Recall:

- ☐ 1 week
- ☐ 2 weeks
- ☐ 3 weeks
- ☐ 1 month
- ☐ 2 months
- ☐ 3 months
- ☐ 4 months
- ☐ 6 months
- ☐ 9 months
- ☐ 1 year

Appendix G: Census Indicators Used for Construction of the SAHRU Deprivation Index

A total of four census-based indicators, which are widely believed to represent or be a determinant of material disadvantage, were used to construct the latest version of the SAHRU Deprivation Index (Kelly and Sinclair, 2007). These were:

Unemployment

Unemployment reflects lack of access to earned income and the facilities of employment. Moreover it may impose other pressures on individuals through loss of self-esteem, and on families through problems and tensions generated. The 'unemployment' indicator is the proportion of the economically active population (15 years or older), which is unemployed or seeking a first time job.

Low Social Class

The Irish Social Class Scale is an ordinal scale from 1 (higher professional) to 6 (unskilled manual). It is based on the concept of groups whose members possess capacities for the generation of income through their occupations, not the status/prestige associated with particular occupations. A social class code of seven is assigned to people who cannot be assigned to any of the other six groups. Being in a low social class, i.e. Class 5: semi-skilled manual occupations (including farmers farming less than 30 acres) and Class 6: unskilled manual occupation, reflects earnings at the lower end of the income scale. Low income limits access to material resources and the ability to make choices in life. The 'low social class' indicator is the proportion of population (social classes 1 to 6 only) in social class 5 or 6.

No Car

Car ownership has been suggested as a surrogate for current disposable income. Apart from the cost of purchasing a car there are the necessary licensing, insurance, maintenance and repair costs, as well as day-to-day running expenses. Car ownership also confers benefits in terms of access to other resources. It might be argued that in city areas, with good access to public transport services, owning a car is not a necessity. Nevertheless despite the availability of public transport ownership of a car appears to be something that many households do wish to achieve. This may be a reflection of the inconvenience and/or limited scope of

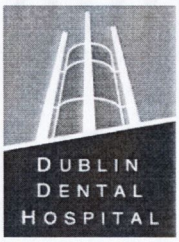
public transport as well as the prestige associated with owning a car. In rural areas car ownership is more of a necessity and its value as a discriminator between affluent and deprived areas may be diminished. The following 'no car' indicator has been used: Proportion of permanent private households with no car.

Local Authority Rented Accommodation

Non-owner occupation has been suggested as a surrogate for income in the long term. Taken together with car ownership these two indicators are likely to provide a fairly good reflection of income levels in different areas.

The 'rented accommodation' indicator is the proportion of permanent private households rented from a local authority, or in the process of being acquired from a local authority

Appendix H: Invitation to Focus Groups & Individual Interviews



Joe Bloggs
Street
Town/City
County

Department of Public and Child Dental Health
Dublin Dental School and Hospital
Trinity College
Lincoln Place, Dublin 2
Phone (01) 612 7303

Friday 24th October 2008

Dear

We are writing to ask if you would help us with some research. Dublin Dental Hospital is hoping to look at the oral health of children with disabilities. We hope to use the research results to plan a better, more family orientated dental service for the future. For the research to be successful, and give us figures to argue our case on your behalf, we need as many children as possible to take part.

We enclose a leaflet giving some more information about the study. If, after reading it, you would like to take part, please would one parent (mother or father) or guardian complete and return a signed copy of the consent form in the pre-paid envelope provided. It would be very helpful to us if you could return your consent form within the next week.

If you would like more information then please contact Dr Darius Sagheri at the address given above, or Professor June Nunn.

Your participation is entirely voluntary and the doctors looking after your child will not know which families are taking part in the study. Whether you decide to participate or not has no implications for the care your child receives. All information supplied will be treated confidentially and **only** used for this research.

Thank you for your time.

Yours sincerely,

Dr Darius Sagheri

Professor June Nunn

Appendix I: Information Sheet for Focus Groups & Individual Interviews

Department of Public and Child Dental Health
Dublin Dental School and Hospital
Trinity College
Lincoln Place,
Dublin 2

INFORMATION SHEET

DENTAL HEALTH OF PRE-SCHOOL CHILDREN WITH DISABILITIES IN IRELAND

You are being invited to take part in a research study. Before you decide it is important that you understand why the research is being done and what it will involve.

Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

We want to look at the oral health of children with disabilities and how parents/guardians access dental services. Professor June Nunn and Dr Darius Sagheri from the Department of Public and Child Dental Health, Trinity College, Dublin and Dr Jan Owens, Research Associate from the Department of Oral Health and Development, Charles Clifford Dental Hospital, Sheffield UK, will be involved with the study.

Why have I been chosen?

You have been chosen because your child is registered with Enable Ireland. All parents/guardians of children with disabilities are being invited to participate. We need to recruit as many children as possible.

Do I have to take part?

It is completely up to you to decide whether or not to take part. You are free to withdraw from the research at any time and do not have to give a reason. The clinicians looking after your child will not know whether you are taking part or not.

What will happen to me if I take part?

If you decide to take part, one or both parents (mother or father) or guardian are asked to bring their child for a dental examination with Dr Sagheri. There will also be the opportunity to take part in either an anonymous one-to-one interview where you can tell us about your thoughts and experiences of your child's oral health with Dr Owens in a place of your choice OR with a group of parents. You do not have to bring your child for a dental examination to take part in the interviews. The choice is entirely yours.

What do I have to do?

If you would like to take part, simply sign one copy of the consent form and return it in the prepaid envelope. You should keep the other signed copy of the consent form and this information sheet for your own records.

What are the possible disadvantages and risks of taking part?

There are no known risks.

What are the possible benefits of taking part?

There might be no immediate or direct benefits to you. This research will help us gain a better understanding of oral healthcare for children with disabilities and the impact on families. This information will be used to inform healthcare professionals about future effective ways of support parents/guardians of children with disabilities.

Will my taking part in this study be kept confidential?

All information that you provide us for this study will be kept **strictly confidential**. The whole study will be conducted according to guidance on ethics from the British Psychological Society (www.bps.org.uk).

To protect your privacy the following measures will be taken to ensure that no-one, apart from the principal researchers (Dr. Darius Sagheri and Dr Jan Owens), have access to your identity:

- Your **name** will **not** appear on any documents. You will be allocated a code number and a false name which will be used as identifiers. Only you and the principal researcher will know your name and code number.
- Your **name** will **not** be used in the analysis or writing up of the findings derived from the study. Your data will be kept in a safe locked cabinet and will only be reviewed by the researchers.
- All information supplied will be kept confidential.

What will happen to the results of the research study?

Following completion of the study we will write to you giving you a summary of our findings. We will also produce reports and related publications based on the results of the study.

Who is organising and funding the research?

The principal researcher (Dr Darius Sagheri) is a dentist specialising in children with disabilities from the Department of Public and Child Dental Health, Trinity College, Dublin, and the co-investigator (Dr Jan Owens) is an experienced researcher specialising in disability from the School of Clinical Dentistry, University of Sheffield, UK. The Health Research Board (HRB) is funding the research.

Who has reviewed the study?

The study's protocol has been reviewed and approved by the Research Ethics Committee.

Who can I contact for further information?

Further information and questions about the study is available from Dr Darius Sagheri, Department of Public and Child Dental Health, Dublin Dental School & Hospital, Lincoln Place, Dublin 2; Ph. (01) 612 7303; darius.sagheri@dental.tcd.ie.

Alternatively, you can contact Professor June Nunn, Department of Public and Child Dental Health, Dublin Dental School & Hospital, Lincoln Place, Dublin 2; Ph. (01) 612 7303; june.nunn@dental.tcd.ie.

What if I wish to complain about the way in which the study has been conducted?

If you have any cause to complain about any aspect of the way in which you have been approached or treated during the course of this study, the normal complaints mechanisms are available to you and are not compromised in any way because you have taken part in a research study. If you have any complaints or concerns please contact either the project coordinator:
Name: Dr Darius Sagheri Ph. (01) 612 7303
OR
You can use the normal hospital complaints procedure and contact the following:
Name: Susanne Bushe, Patient Services Manager Ph. (01) 612 7360

Under the Health Act 2004 (Complaints regulations, SI652 of 2006) if the complainant is unhappy with the outcome of the complaint he/she may request a review of the recommendations by the appointed review officer.
If you are still unhappy with the outcome the complainant may refer to the Office of the Ombudsman for Children as appropriate.

What if I am harmed?

If you are harmed by your participation in this study, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Fair Processing Notice

Your personal data will be used only in accordance with the Data Protection Acts 1988 and 2003. Dublin Dental School & Hospital will not disclose any personal information to any other third parties, except where required by law, without your express consent.

Further details in relation to the use of personal data can be found on The Data Protection Commissioners web site. Web site details http://www.dataprotection.ie

Thank you for reading this.

We hope you wish to participate.

Date: 24/10/08 Version number: 1.0