ORAL HEALTH ASSESSMENT

Best practice guidance for providing an oral health assessment programme for school-aged children in Ireland

Feidhmeannacht na Seirbhíse Sláinte
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Oral Health Assessment

Best practice guidance for providing an oral health assessment programme for school-aged children in Ireland

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What is an evidence-based guideline?

Evidence-based clinical practice guidelines are systematically developed statements containing recommendations for the care of individuals by healthcare professionals that are based on the highest quality scientific evidence available. Guidelines are designed to help practitioners assimilate, evaluate and apply the ever-increasing amount of evidence and opinion on current best practice, and to assist them in making decisions about appropriate and effective care for their patients. Their role is most clear when two factors are present: (a) evidence of variation in practice that affects patient outcomes, and (b) a strong research base providing evidence of effective practice.[1] However, it is often in areas where evidence is weak or conflicting that guidance for clinicians and policy makers is most needed. In such cases, consensus can be used by guideline developers to assist in the formulation of recommendations. It is important to note that guidelines are not intended to replace the healthcare professional's expertise or experience, but are a tool to assist practitioners in their clinical decision-making process, with consideration for their patient's preferences. To assist the reader of this guideline, the key to the grading of evidence and recommendations is presented below.

LEVELS OF EVIDENCE

1++	High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias
1+	Well conducted meta-analyses, systematic reviews or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews or RCTs with a high risk of bias
2++	High quality systematic reviews of case-control or cohort studies High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

GRADES OF RECOMMENDATIONS

A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population OR A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results OR Extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population, and demonstrating overall consistency of results OR Extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4 OR Extrapolated evidence from studies rated as 2+
GPP Good Practice Point	Recommended best practice based on the clinical experience of the Guideline Development Group

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About this guideline

In the Republic of Ireland, the Health Service Executive (HSE), which is the national authority responsible for health and personal social services, has statutory responsibility to make dental services available, free of charge, to children under the age of 16.[2-5] The focus of this guideline is on the oral health assessment of school-aged children as part of these state-funded services. These services are currently provided by the HSE Public Dental Service. In the Republic of Ireland, the minimum age at which a child can start school is four, although most children are age five at school entry. The upper age limit for entitlement to state-funded oral health services for children is 15. In this guideline, the terms 'school-aged children' or 'school children' cover the age range 4–15 years, and we use 'age 5' when referring to children in Junior Infants class. The term 'oral health assessment' refers to the process of identifying children who would benefit from dental services.

This guideline is the fourth in a series of evidence-based guidelines developed for the HSE Public Dental Service and should be read with reference to the other guidelines in the series.[6-8] While this guideline deals specifically with school-aged children, guidance on the early identification of high caries risk preschool children is contained in the guideline *Strategies to prevent dental caries in children and adolescents.*[7] Recommendations on the use of topical fluorides and pit and fissure sealants for caries prevention can be found in the corresponding guidelines.[6,8] These guidelines are available at http://ohsrc.ucc.ie/html/guidelines.html.

What this guideline covers:

- Timing and frequency of oral health assessments for school-aged children
- Appropriate setting for oral health assessments for school-aged children
- Cost effectiveness of conducting oral health assessments in the school and in the clinic
- Best practice for conducting oral health assessments
- Data collection and audit

What this guideline does not cover:

- Oral health assessment programmes for preschool children or for children attending special schools (This is covered in the guideline *Strategies to prevent dental caries in children and adolescents*[7])
- Clinical treatment planning or provision of treatment following oral health assessment. This is covered in the dental clinical guidance *Prevention and Management of dental caries in children*[9] which was developed by the Scottish Dental Clinical Effectiveness Programme and is available at http://www.sdcep.org.uk/
- Oral health services for adults

The aims of this guideline are to:

- Provide an evidence-based approach to the delivery of state-funded oral health assessments for school-aged children
- Reduce variation in practice by standardising the approach to the delivery of state-funded oral health assessments for school-aged children.

Who is this guideline for?

This guideline is for policy makers, managers of public dental services and all staff working in the Public Dental Service. Although developed for the Public Dental Service, this guideline is relevant to general dental practitioners and paediatric dentists and their dental teams. It will also be of interest to parents, teachers, and all those involved in working with children.

How was this guideline developed?

This guideline was developed by a Guideline Development Group based on a review of the international literature on public dental services for school children (Appendix 1), age of emergence of permanent teeth,[10-16] rates of caries progression[17-26] and relevant evidence-based guidelines.[6-9,27,28] In the absence of a new national oral health policy, the Guideline Development Group was guided by current national oral and general health policy documents.[29-31] The recommendations of two reviews of the Public Dental Service commissioned by the Department of Health and Children in 2008[32] and by the HSE in 2010[33] were also taken into account. Recommendations were formulated by the Guideline Development Group using informal consensus methods, following consideration of the available evidence and advice received during the consultation process.

Recommendations for an oral health assessment programme for school-aged children

Dental caries is the single most common chronic childhood disease.[34] Access to oral health care from early childhood onwards is a basic need for all children.[30] Ensuring that children are given an appropriate dental recall interval is a professional and ethical requirement for dentists.[35] Regular oral health assessment is fundamental to promoting, protecting and improving children's oral health; it allows caries to be detected at an early stage and treated using non-operative or minimally invasive techniques. Early effective intervention is easier for the child and avoids invasive and more costly treatment. Regular oral health assessment also allows oral development to be monitored so that appropriate advice, treatment or referral can be provided in a timely manner. Another essential feature of regular oral health assessment is that it provides the opportunity to reinforce good home care practices, which are the key to lifelong oral health.

While the focus of this guideline is on school-aged children, the recommendations build on those of earlier guidelines in this series, which outline the measures that need to be taken at whole population, targeted population and individual level to prevent and control dental caries from infancy to adolescence.

RECOMMENDATION	Grade of Recommendation
To optimise effectiveness, an oral health assessment programme for school-aged children should operate against a background of: a) Population-level oral health promotion strategies b) Integrated primary health care services for children, to allow early identification and referral of high caries risk preschool children into dental services.[7]	**D**
Oral health assessments for school-aged children should be conducted in a dental clinic.	**GPP**
All children should be offered an oral health assessment, including a formal caries risk assessment, during their first year in primary school.[7] *Formal caries risk assessment is an important component in developing an appropriate oral health care plan for each child, and the baseline risk assessment at school entry allows changes in risk status to be monitored over time. A Caries Risk Assessment Checklist has been developed specifically to assist clinicians in assessing the individual caries risk of children in Ireland. The Caries Risk Assessment Checklist and accompanying notes can be found in Appendix 4.*	**D**

To promote, protect and improve children's oral health from school entry onwards, the interval between oral health assessments for school-aged children should not exceed 12 months.[27] *The recall interval for individual children should be informed by the Caries Risk Assessment, and children who are considered high caries risk may need a shorter recall interval.*	**GPP**
A school-linked* approach to offering oral health assessments should be maintained and strengthened. *A school-linked approach ensures that children are not lost from the system even if they change school or address. It also raises the profile of oral health within the school, which may encourage uptake of oral health assessments. All parents should be made aware of the importance of oral health assessments so that children who are home-schooled have the opportunity to register with the dental service.*	**GPP**
Oral health assessments should be conducted in accordance with best practice, as outlined in Section 3 of this guideline, and summarised on pages 6–7.	**GPP**
Caries preventive strategies should be provided to children in accordance with the recommendations of the guidelines on *Topical Fluorides*,[6] *Strategies to Prevent Dental Caries*[7] and *Pit and Fissure Sealants.*[8]	**D**
Standardised data on the uptake, outputs and clinical outcomes of the oral health assessment programme should be collected locally and compiled nationally.	**GPP**

**School-linked means that there is a connection between the school and dental services for administration of the oral health assessment programme (e.g. use of class lists or distribution of consent forms) or for facilitating oral health promotion initiatives. Oral health assessments are conducted in the dental clinic.*

Oral health assessment programme for school-aged children: Summary

A programme of annual oral health assessments for children from school entry (age 5) up to the age of 16 is proposed as the best practice approach for promoting, protecting and maintaining the oral health of school-aged children in Ireland. The key elements of the proposed programme are summarised below.

CLASS	Junior Infants	Senior Infants	1st class	2nd class	3rd class	4th class	5th class	6th class	1st year	2nd/3rd year
AGE	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14–15
KEY DEVELOPMENTAL MILESTONES	Emergence of: • First permanent molars • Central incisors					• Emergence of maxillary canines • Emergence of second permanent molar				
ORAL HEALTH ASSESSMENT *(from school entry)*	• Medical, Dental and Social history • Clinical examination* • Caries Risk Assessment^			***As for Age 5–7, plus*** • Assess fissure sealant status • Palpate for maxillary canines		***As for Age 5–9, plus*** • Palpate for maxillary canines; consider radiographs if concerned about canine displacement • Assess orthodontic treatment need • Assess for approximal caries • Assess periodontal health • Assess for tooth wear			***As for Age 5–12***	
CARIES PREVENTION	Encourage • Healthy eating in line with national dietary guidelines • Limiting consumption of sugar-containing foods and drinks and, when possible, confining their consumption to mealtimes • Use of fluoride toothpaste containing at least 1,000 ppm F, twice a day – at bedtime and at one other time during the day			***As for Age 5–7, plus*** • Repair or replace defective or missing sealants		***As for Age 5–9, plus*** **<u>High caries risk:</u>** • Apply and maintain fissure sealant to second permanent molars			***As for Age 5–12***	

	<u>High caries risk</u>‡: *As above, plus* • Apply fluoride varnish 6/12 or 3/12 • Apply and maintain fissure sealant to first permanent molars • Apply fluoride varnish or consider glass ionomer as an interim sealant if moisture control is inadequate			
RECALL	Within 12 months	Within 12 months	Within 12 months	Within 12 months
CLINICAL AUDIT	Number and percentage of children in each class: • receiving an oral health assessment • being assessed as high caries risk • receiving recommended preventive care • being recalled within a 12 month period	***As for Age 5–7, plus*** Number and percentage of 8-year-old children: • with caries experience (i.e. untreated caries, filling or extraction due to caries) in one or more first permanent molars • with fissure sealant on 1st permanent molars • with trauma to permanent incisors	***As for Age 5–7, plus*** Number and percentage of children in each class: • receiving an orthodontic assessment • meeting HSE orthodontic referral criteria • having bitewing radiographs taken • having one or more permanent teeth extracted due to caries • having untreated caries or restorations for caries in permanent teeth • with fissure sealant on permanent molars • with trauma to permanent incisors	***As for Age 5–7, plus*** Number and percentage of children in each class: • having bitewing radiographs taken • with caries experience (i.e. untreated caries, filling or extraction due to caries) in permanent teeth • With trauma to permanent incisors
GOAL	**<u>Age 5:</u>** • Reduction in the number and percentage of children with caries experience in primary teeth • Reduction in overall caries experience (mean dmft/s) **<u>Age 5–7:</u>** • Reduction in number of children requiring dental general anaesthesia	**<u>Age 8:</u>** Reduction in the number and percentage of children: • with caries experience in first permanent molars • with first permanent molars extracted due to caries	**<u>Age 12:</u>** • Increase in detection of ectopic canines • Reduction in the number and percentage of children with caries experience in permanent teeth, particularly extractions due to caries • Reduction in overall caries experience (mean DMFT/S) • Reduction in untreated trauma	**<u>Age 15:</u>** *As for age 12*

** Extra oral and intra oral examination, including assessment of oral hygiene, caries, tooth wear, trauma and oral development. See Section 3 for more details.*

^ *See Appendix 4*

¥ *See Appendix 7 for a summary of European recommendations on selection criteria for taking bitewing radiographs and intervals between bitewing examinations*

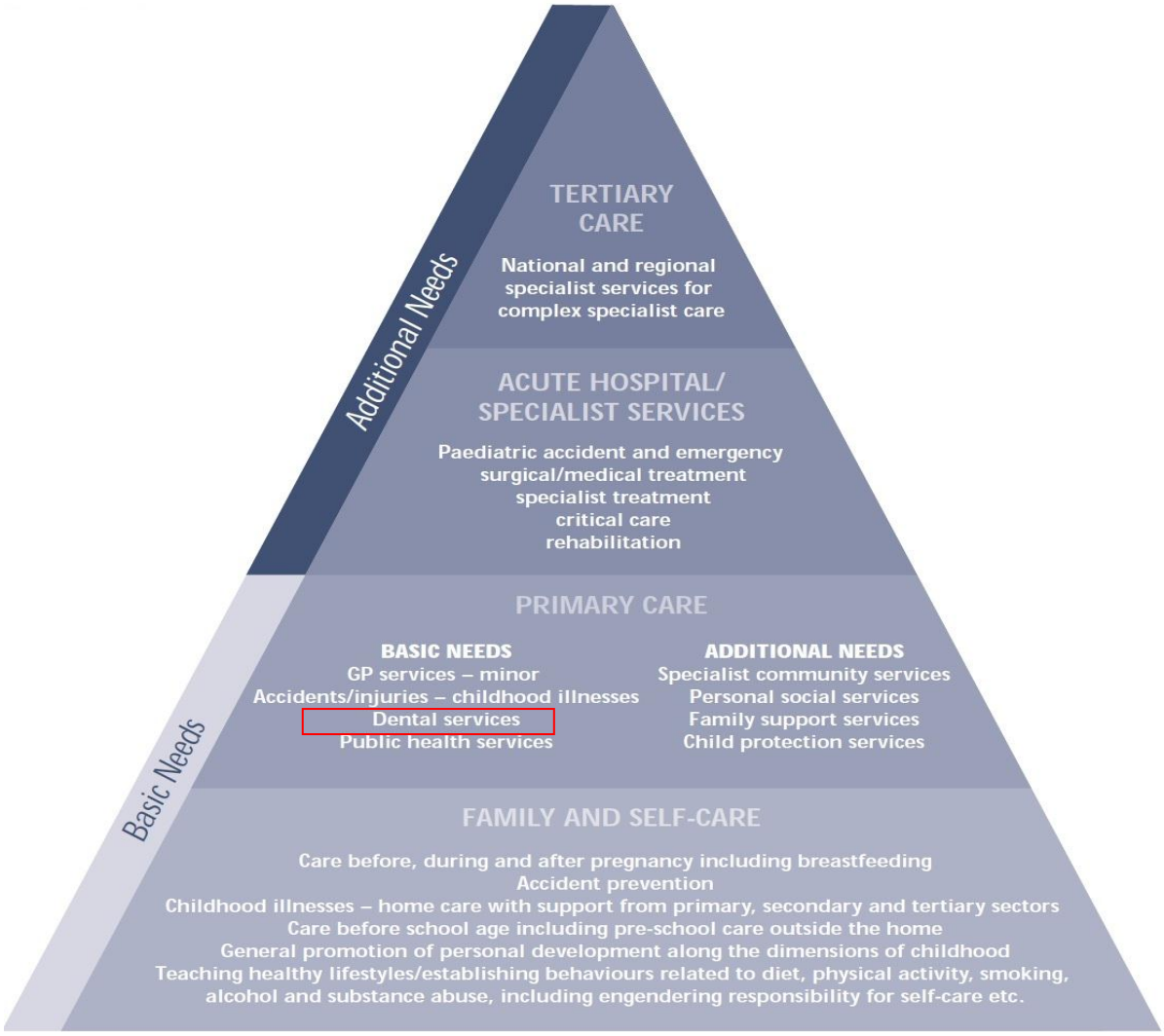
‡ *High caries risk refers to children who are at risk of developing high levels of dental caries, or who are at risk from the consequences of caries, including those who are at risk by virtue of their medical, psychological or social status, i.e. at risk* of *or* from *caries.*

1. Introduction

The promotion and protection of the health of children is a common aim of health services throughout the world. Early detection of problems and early effective intervention are essential to ensuring that each child attains their full health potential. These principles apply equally to oral health, which is an important component of a child's general health and well-being.

Dental caries is the single most common chronic disease of childhood.[34] In the Republic of Ireland, two out of every five children in their first year in primary school have experienced decay in their primary teeth; one in twenty has had at least one primary tooth extracted because of decay.[36] By the time children leave primary school, over half of them have experienced decay in their permanent teeth. By age 15, this will have increased to three out of every four children.[37] The importance of equitable access to primary care dental services for children was recognised in the first national oral health strategy – *The Dental Health Action Plan,*[29] and is reinforced in the current national health strategy – *Quality and Fairness*[30] – which lists primary care dental services as a basic healthcare need for children (Figure 1.1).

Figure 1.1: Health care needs of children at different levels of care. Taken from the national health strategy *Quality and Fairness, 2001*[30]



Internationally, different healthcare systems have different arrangements for providing primary care dental services to children (Appendix 1). In the Republic of Ireland, dental services for children are part of a subset of defined 'core services' which include childhood immunisations, developmental services and school health services. These 'core services' are free of charge for all.[30] However, universal eligibility does not translate into universal availability, and there is considerable variation throughout the country in the availability and continuity of state-funded dental services for children. While an emergency service is available for all eligible children, access to state-funded oral health assessments (dental check-ups) and treatment generally commences in primary school and is limited to specific 'target' classes, which means that the interval between assessments for most children exceeds two years. An anomaly exists within state-funded dental schemes in Ireland in that eligible adults can avail of a free annual dental examination whereas children cannot.

1.1 State-funded dental services for school-aged children

There has been an explicit statutory requirement for the national health authority of the Republic of Ireland (currently the Health Service Executive – HSE) to provide dental services to eligible children since the 1950s.[2,38,39] Originally, only children under the age of 6 years and children in national (State primary) schools were eligible for state-funded dental treatment. From 1994 onwards, legislative amendments have extended eligibility to all children under the age of 16 years[3-5,40] and have specified the dental services to be provided to school-aged children as follows:

a) a dental health screening service,

b) a preventive dental treatment service, and

c) a primary care dental treatment service in respect of defects noted during a screening examination carried out under paragraph (a).[4]

These services are delivered through the School Dental Programme of the HSE Public Dental Service. There is no other state-funded or subsidised dental service available for children and many parents, particularly those who cannot afford to pay privately for treatment, rely on the services provided by the HSE Public Dental Service to meet their children's oral health needs.

Although the legislation refers to 'a dental health screening service' and 'screening examination', there is no definition of what this means. As a result, there is no shared understanding of the term 'screening' within the HSE Public Dental Service,[33] and the term is used interchangeably to describe different activities within the School Dental Programme as well as to describe the entire Programme. To add to the confusion, in public health the term 'screening' has a very specific meaning, and is defined as *"the process of identifying apparently healthy people who may be at increased risk of a disease or a condition. They can then be offered information, further tests and appropriate treatment to reduce the risk and/or any complications arising from the disease or condition."* (UK National Screening Committee, http://www.screening.nhs.uk/screening [Accessed 18/11/2011]. However, in the dental literature, dental 'screening' typically involves the identification of children who already have obvious disease (e.g. caries involving dentine or cavitation) or conditions, and therefore is in conflict with the concept of early detection and prevention of disease. (For further discussion on school screening in the international literature, see section 2.1.)

The current paradigm in modern dentistry is the detection and assessment of caries at an early stage in the process, when non-operative preventive measures or minimally invasive measures can be used to manage the disease.[41-43] The traditional 'drill and fill' approach commits a tooth to a cycle of restoration replacement, since most permanent restorations have a limited lifespan. The early intervention approach to managing caries is particularly important for children: it avoids the direct impacts of extensive decay such as pain, swelling, loss of sleep, and the indirect impact of invasive dental treatment which can be distressing for both child and parent. Effective measures to prevent and control caries are available.[6-8] By managing dental caries preventively rather than operatively, the restoration spiral is avoided, which should result in improved oral health and medium and long-term cost savings.

Oral health assessment is the starting point for assessing a child's oral health needs and developing an appropriate individual care plan. For clarity, in this guideline we have avoided using the term 'screening' except where it has been used in the dental literature or in a report. Instead, we use the term 'oral health assessment' to describe the process of identifying children who would benefit from dental services.

1.1.1. Background to current services for school-aged children

In any publicly-funded health service, a control mechanism is required to prioritise access to services. This should be based on the principles of equity and need, as outlined in the national health strategy *Quality and Fairness*.[30] In the Public Dental Service, which has a population remit for the provision of oral health services to children under the age of 16, the established control mechanism has been through targeting particular school classes for receipt of dental care. The 'target class' approach focusing on 1st class and 6th class was first advocated in a review of public dental services in the late 1980s, commonly referred to as the Leyden report,[44] and was a response to limited resources at the time. The authors of the report stated that they wished to see an annual screening service for eligible children as the norm. However, in recognition of the resource constraints at the time, they recommended targeting routine dental treatment services at children in 1st and 6th class so that fissure sealants could be applied to the newly erupted permanent molar teeth prevent caries. The prioritisation of the restoration of permanent teeth over primary teeth was also suggested, given the limited resources. The report, however, did recommend more frequent 'screening' of children at high risk of dental caries.[44] The target class approach was deemed to be the most equitable way of making children "*dentally fit before they pass from the health board system*."[44] While the target class approach offered advantages in terms of facilitating strong links between the Public Dental Service and schools, it had the disadvantage of formalising an intermittent approach with a focus on permanent teeth as the norm, rather than as a substitute for what was actually considered best practice – annual assessment.

The targeted approach was subsequently enshrined in the first national oral health strategy in 1994 – *The Dental Health Action Plan*[29] – as a system of service delivery which ensured *"optimum use of resources and equal access for all national school children to the same level of dental care."* The targeted approach was to be 'consolidated and extended' under *the Dental Health Action Plan*, but precisely which classes were to be targeted and how children were to be 'screened' was not specified. The *Dental Health Action Plan* was incorporated into the national health strategy – *Shaping a*

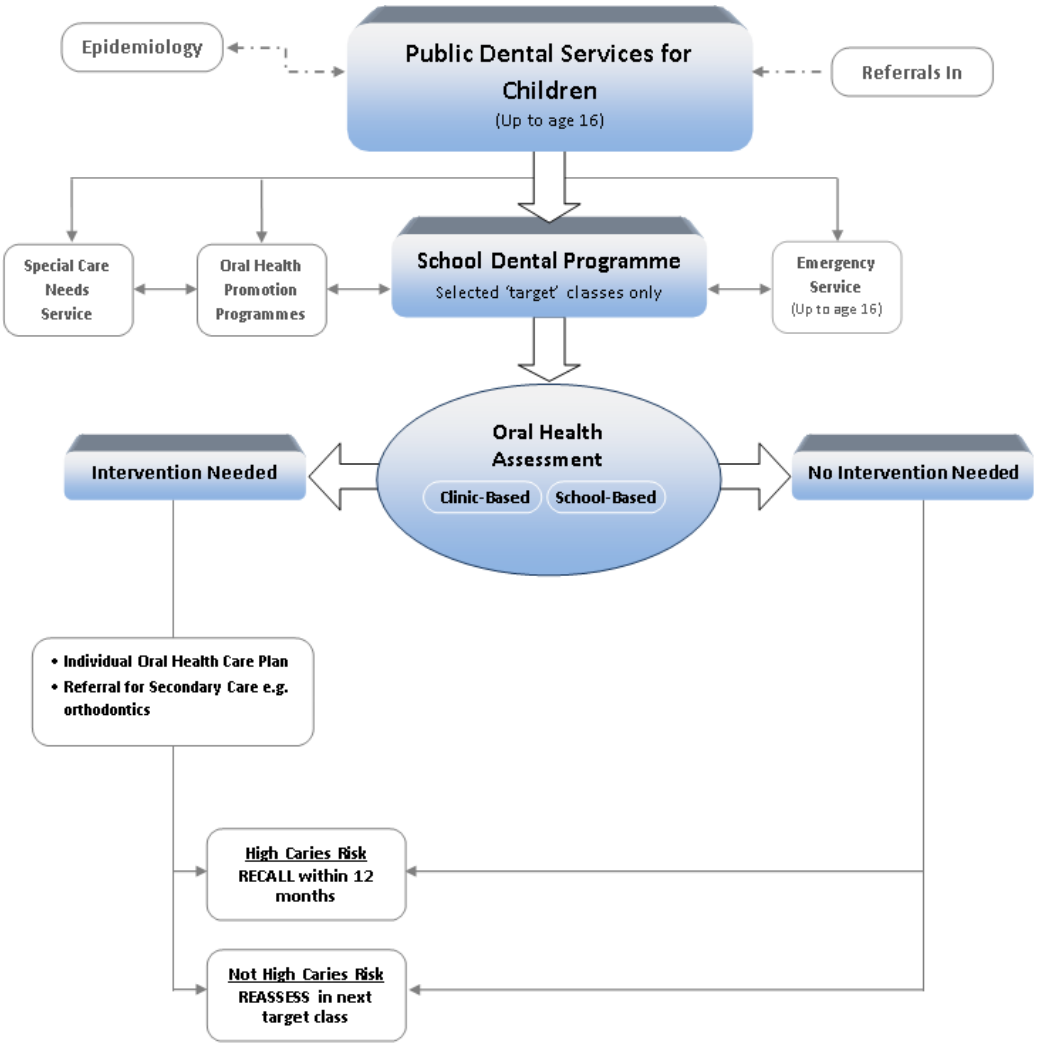
Healthier Future[45] – which referred to *"systematic screening of children in three designated classes in primary and secondary schools"*, but once again, the 'designated classes' were not specified, and it was unclear if the reference to 'three classes' meant three classes in total or three classes at both primary and secondary level, were to be 'screened'. Similarly, there was no elaboration of what 'screening' entailed, which allowed the Public Dental Service to choose between conducting oral health assessments in the school, which was historically how 'screenings' had been done, or in the dental clinic, which is the 'gold standard' setting for oral health assessments. In practice, the choice of setting was often driven by resources, with the school setting being chosen in areas where resources were insufficient to offer all children in target classes an oral health assessment in the dental clinic. Thus, the proposed benefit of the target class approach for ensuring *"equal access for all national school children to the same level of dental care"* was undermined from the outset, since it was clearly inequitable that in some parts of the country resources were available for children to receive an oral health assessment in the dental clinic, while in other areas children were only offered a brief assessment in the school, conducted under less than ideal circumstances and using procedures that had not been standardised between areas.

The key aims of the Public Dental Service with regard to children's service are to reduce the level of dental disease and to provide adequate treatment services.[45] It is important to note that the target class approach was never envisaged as a 'stand-alone' service, but was meant to operate against a background of enhanced population and targeted population preventive strategies involving the use of fluorides, and an integrated common risk factor approach to oral health promotion. However, this aspect of the Action Plan was never fully implemented, as some areas had qualified, dedicated oral health promotion staff whereas others did not. In practice, the target class approach was formalised as the School Dental Programme and has become the core function of the Public Dental Service (Figure 1.2).

1.1.2. Current status of the School Dental Programme

As the only source of state-funded dental care for children, the uptake of the School Dental Programme is generally high, with reports of 80%[46] to 91%[47] of children in target classes utilising the service. The limited data on dental attendance of children in Ireland[37,48] suggest that regular private dental attendance, as an alternative or supplement to state-funded dental care, is not the norm, particularly for younger children. For example, a survey of 3,310 5-year-olds in the North East of Ireland – an age group not targeted by the School Dental Programme – found that most children (69%) had never been to a dentist.[48] This is in stark contrast to dental attendance figures in the UK, where only 6% of 5-year-olds have never visited the dentist.[49] Given the generally high uptake of the School Dental Programme once children reach a 'target' class, this would suggest that many parents rely on state-funded dental services for their children's oral health needs. The School Dental Programme is also the gateway to state-funded orthodontic services, for which there is high parental demand. Dentists working in the Public Dental Service have been trained to assess children according to agreed criteria based on the Modified Index of Orthodontic Treatment Need (Appendix 2) and are important gatekeepers to expensive secondary care orthodontic services.

Figure 1.2: Organisation of current Public Dental Services for children, showing the core role of the School Dental Programme



Geographic variation persists in both the classes targeted and the setting for assessing children. For example, in some parts of the country children at school entry, i.e. age 5 (Junior Infants class) may be offered an oral health assessment, whereas in other areas children could be age 7 or 8 (1st or 2nd class) or older before they are offered their first oral health assessment through the School Dental Programme. Despite the extension of eligibility for state-funded services to children under the age of 16, the School Dental Programme has rarely extended beyond primary school. Consequently eligible adolescents generally can only avail of an emergency service. Intervals of two years or more between oral health assessments are common. This means that children, whose mouths are undergoing continuous growth and development during their school years, have less access to regular check-ups than eligible adults who are entitled to an annual dental examination through the two state-funded dental schemes for adults. Unlike adults, children are not assured of having their oral health assessment conducted in a dental clinic but may be assessed either in school or in a clinic, depending on how the School Dental Programme is delivered where they live. Oral health assessment in the school is a resource-driven activity which is used in some dental areas to stretch already limited services to as many children as possible. However, in the development of this guideline the following concerns were raised regarding oral health assessments conducted in the school:

- An oral health assessment conducted in the school cannot be as accurate as a clinic-based examination, which is the gold standard for dental practice.
- The consequences of missing early disease or dental anomalies with assessment in the school could result in pain/complications for the patient and ultimately, more costly treatment.
- Parents may not be aware of the limitations of the school setting for oral health assessment, and may mistakenly believe their child has had the equivalent of a clinic-based assessment.
- Where oral health assessments are conducted in the school for all target classes, children could pass through primary school without ever having an oral health assessment in the dental clinic.

1.2. Reviews of the Public Dental Service and the School Dental Programme

Several reviews of the public dental service have been undertaken since the publication of the Dental Health Action Plan in 1994.[32,33,50,51] A common finding of these reviews is the variation in the delivery of the School Dental Programme across the country, including the gap in service provision for children once they leave primary school. The availability of resources has been identified as a crucial factor in the geographic variation in public dental services. A report commissioned by the Department of Health and Children in 2008 noted that "*On patient equity grounds however, we find it surprising that these geographical differences exist in the PDS* [Public Dental Service]*"* [32] and suggested that reallocation of resources within the Public Dental Service was needed.

The most recent reports from 2008[32] and 2010[33] highlighted the lack of health-related outcome measures to evaluate the impact of the School Dental Programme (referred to in the reports as 'school screening') and identified the urgent need for a new national oral health policy with clear priorities and targets to guide the development of public dental services. The 2010 review by PA Consulting[33] also noted the need for clear communication with parents about what can be expected from the service.

While the PA Consulting review acknowledged that dental 'screening' was a cornerstone of the preventive approach in the Public Dental Service and was a *"critical service"* in most dental areas, it also stated that *"the current approach to 'screening' needs to be radically overhauled."* This guideline provides recommendations on how this should be done.

2. Development of guidance

A Guideline Development Group representing key stakeholders was established to develop evidence-based guidance on the delivery of the School Dental Programme. In the absence of a new national oral health policy, the Guideline Development Group was guided by current legislation[2,3,5] and national oral and general health policy documents.[29-31] The recommendations of the two recent reviews of the Public Dental Service[32,33] were also influential in the development of this guidance. As this guideline forms part of a 'suite' of guidelines for the Public Dental Service, the Group ensured that its recommendations were consistent with the three existing guidelines.[6-8]

The Guideline Development Group agreed that the overall aim of the School Dental Programme is to improve the oral health of school children by:

- Identifying children at key stages of dental development, who would benefit from preventive or treatment services or who are at risk of developing dental or oral disease/conditions;
- Providing the required care and/or referral for secondary care services in a timely manner appropriate to need.

The effectiveness of the Programme should be evaluated against these aims.

As preparation for guideline development, an internet search was conducted using Google to provide an overview of public dental services for school children in high-income countries. The results of this search are summarised in Appendix 1 and illustrate the unique nature of state-funded dental services for children in Ireland, which have a population remit for children under the age of 16 but operate without a system which allows for universal access and continuity of care. In addition, a literature search was conducted in PubMed to identify publications on the subject of 'school dental screening', to explore how dental 'screening' is used in other countries and to identify any evidence that might inform decisions on the most appropriate setting for conducting oral health assessments for school-aged children.

The Guideline Development Group agreed that key developmental milestones in the oral development of school-aged children, namely the timing of emergence of permanent teeth and the development of the occlusion, should be used as the basis for informing the timing of oral health assessments. While there are several oral conditions for which children should be assessed, it was agreed that the interval between assessments should be based on the rate of caries progression, given that caries is the most common oral condition affecting children. The key questions to be addressed by the guideline therefore related to the timing of emergence of the permanent teeth and the rate of caries progression in primary and permanent teeth in children and adolescents. Separate search strategies for tooth emergence and for caries progression (Appendix 3) were developed for PubMed and were updated before the guideline was finalised. Longitudinal studies were selected in preference to cross sectional studies. Relevant text books and published clinical guidance were also consulted (Appendix 3).

2.1. Dental 'Screening' of school-aged children in the literature

In the dental literature, dental 'screening' generally refers to the brief oral examination of children, usually in the school setting, in order to identify those with obvious treatment needs. School dental screening programmes reported in the literature mainly screen for dental caries or its consequences (i.e. pain, sepsis). However, other conditions such as trauma, malocclusion, pathology or very poor oral hygiene or gum health have also been included as criteria for referral from school-based screening.[52-55]

Assessment in the dental clinic, with the facilities to clean, dry and illuminate the teeth, provides optimal conditions for detecting early stages of caries and is the cornerstone of modern dental practice in high-income countries. In school screening programmes, the threshold for identifying caries is usually obvious caries or cavitation, reflecting the sub-optimal conditions, such as poor lighting, moisture control and cleanliness of the teeth, under which teeth are often examined.[54,56] School-based dental screening thus tends to identify individuals with a relatively advanced stage of caries, which is contrary to the principles of screening for early detection of disease as well as to the modern paradigm of non-operative caries management.

School dental screening in other countries often operates parallel to the main system of dental care (be it private or social insurance, or universal access); in these circumstances, screening is used as a means to encourage dental attendance[57-60] or registration with a dentist.[61] It may also operate as a public health "safety net" service for identifying children with urgent dental needs, where parents cannot afford private dental insurance.[54] Studies which have evaluated dental attendance or dental registration following screening have found conflicting results, with some reporting significantly increased attendance in the screened group compared to an unscreened control group[55,59,60] and others showing no difference in attendance[57] or registration[61]. Unlike the situation in Ireland, in other countries the 'screening' and the treatment functions are often handled by separate entities, and the degree to which parents are facilitated to access dental services following screening varies. With the exception of studies which provided intensive follow-up[59] or incentives[62] to encourage dental attendance among those who screened positive, dental screening studies have consistently reported that less than half of the children who screened positive for needing treatment actually attend or register with a dentist following screening.[58,60,61,63-65]

Most of the research on the effectiveness of school dental screening has come from the UK, which has a long history of statutory support for screening. Milsom and co-authors undertook a large-scale cluster randomised controlled trial in the northwest of England to evaluate the effectiveness of school dental screening at reducing levels of untreated decay.[57,65] In this study, the screening and treatment functions were split between two separate dental services, with no direct link between the two. Parents of children who screened positive were notified by post that their child needed treatment and were encouraged to attend the dentist. No additional measures were taken to ensure the child attended. It is important to note that in the UK, free dental services are provided by the National Health Service (NHS) for children up to the age of 18 and therefore cost of dental attendance was not a barrier. The study showed that school dental screening did not improve the dental health in the target population[57] (children aged 6–9 years) and tended to exacerbate social division in health service utilisation, since those who were better off were more likely to go to the dentist following screening.[65] Based on these

results, the UK National Screening Committee concluded that there was no evidence to support the continued population screening for dental disease among children aged 6–9 years (http://www.screening.nhs.uk/dental). The UK Department of Health subsequently advised Primary Care Trusts to review their screening programmes.[66]

In Scotland, a form of school dental screening – the *"Basic Inspection*" – continues to operate, and has two functions: (a) to inform parents of their child's oral health needs so that they can arrange necessary treatment, which is free under the NHS Scotland and (b) as a crude measure of population oral health need. The *"Basic Inspection*" is part of the National Dental Inspection Programme (NDIP) and involves an annual inspection using a light, mirror and ball-ended probe for children in Primary 1 (school entry) and Primary 7 (primary school exit). The treatment needs of each child are assigned to one of three categories (A, B, C) based on level of treatment need. The results of the *"Basic Inspection"* are used to inform parents of their child's oral health needs, and the distribution of categories A, B and C across Scotland is used to monitor the impact of local and national oral health improvement programmes and to assist in the development of local dental services.[67]

In the United States, a recent development has been the legislative requirement for children to have a dental screening certificate on school entry (and in some states, at school exit), the aim of which is to raise awareness of the importance of oral health as well as to encourage dental attendance.[68] In Ontario, Canada, public health departments are required to identify and ensure necessary care is provided to eligible children with preventive and urgent dental care needs. This is done through school screening programmes conducted by trained dental hygienists. Parental failure to ensure care for children with urgent dental needs constitutes child neglect under provincial child welfare legislation, and parents can be compelled to provide necessary care.[54]

2.1.1. Summary

It is difficult to apply the results of studies from other countries to the situation in the Republic of Ireland due to differences in the aim of the school 'screening' (e.g. to stimulate dental attendance or to directly provide services), differences in the background system of oral health care and differences in caries prevalence. It is clear, however, that even in systems where there is universal or subsidised access to care, a substantial proportion of children – usually those who are most disadvantaged – do not make use of these services and have obvious treatment needs. School dental screening, as described in the dental literature, can identify these children. However, where the screening and treatment functions are separated, intensive follow up, incentives or legislation are required to facilitate dental attendance; otherwise screening can widen the social divide in oral health, since those who have the greatest treatment needs are least likely to attend.[65] The population-based approach of the School Dental Programme in Ireland, whether children are assessed in the school or the clinic, coupled with its ability to offer appointments directly to parents following assessment, is one of its great strengths.

2.2 Setting for oral health assessment

One of the greatest concerns of the Guideline Development Group was the accuracy of school-based assessment compared with clinic-based assessment. Few studies have made this comparison,

possibly because they are two completely different activities, with different thresholds for caries detection. We found only two studies that compared the accuracy of school-based 'screening' using standardised referral criteria against standardised clinic-based assessment. In both studies, the clinic assessment was used as the 'gold standard'. In the first study, conducted in a high caries population in England among children aged 4–11 years, caries was recorded at dentine level by two examiners in the school. Compared to the clinic assessment using the same caries diagnostic criteria, the school screening accurately identified children who had no caries (specificity ≥ 95%) but failed to identify many of the children with caries in permanent molar teeth (sensitivity 32% for examiner 1 and 53% for examiner 2).[69] The other study[70] was conducted in a low-caries Swedish population (age range: 10–13 years), where annual dental examinations in the clinic were the norm for children. This study compared the accuracy of examination in the school with examination in the dental clinic. While this study showed good agreement between examinations of the children in the school and in the clinic, with only 2 children being falsely assessed in the school as having no caries into dentin, the prevalence of caries in this population was far lower than Ireland: only 17% of the Swedish children assessed in the clinic had caries lesions into dentine in one or more tooth surfaces. In Ireland, survey data show that 28% of 12-year-old children in fluoridated areas and 36% in non-fluoridated areas have untreated caries into dentine in permanent teeth.[36] The authors of the Swedish study noted that screening children in the school would be of most benefit the higher the proportion of caries-free individuals in a given population. It is interesting to note that even in this low-caries Swedish population, school-based assessment was recommended by the authors as a complement to, and not as a replacement for, clinic-based assessment.

2.2.1 Cost effectiveness of oral health assessments in the school vs clinic

As part of the guideline development process, we attempted a desk-top assessment of the cost effectiveness of oral health assessments conducted in the clinic and in the school to determine if one method offered an advantage over the other in terms of efficiency and cost. However, due to the lack of standardisation in the practice of both procedures, the number of assumptions that had to be made about timings and costs, and the lack of data to measure effectiveness (e.g. numbers requiring and subsequently receiving treatment), we were unable to make a meaningful comparison of the cost-effectiveness of the two methods. The lack of information on the costs and outcomes of the school 'screening' programme was also noted in the review of public dental services by Oral Care Consulting.[32]

2.2.2. Recommendation on the appropriate setting for oral health assessments provided by the School Dental Programme

Oral health assessment in the dental clinic is the basis of modern dental practice. Taking into account the principles of quality and best practice, the Guideline Development Group agreed that the dental clinic was the best setting to conduct oral health assessments for school-aged children. The Group acknowledged that the practice of assessing children in the school is a resource-driven activity. While school-based assessment may be expedient when resources are constrained, it does not constitute best practice for assessing the full range of health needs of school children during a critical period of their oral development.

Recommendation

➢	Oral health assessments for school-aged children should be conducted in a dental clinic	**GPP**

2.3. Timing of oral health assessments

The Guideline Development Group considered that the age of emergence of the first and second permanent molar teeth and the permanent maxillary canines were the most important oral developmental milestones for school-aged children: the permanent molars because they account for 80% or more of the total caries experience in permanent teeth of children in Ireland[36]; the permanent maxillary canines because displacement or impaction of these teeth can lead to serious complications such as root resorption which could compromise the viability of adjacent teeth. Regular oral health assessment during these key developmental stages is critical to protecting, maintaining and improving children's oral health. The interval between these 'milestone' assessments would be informed by evidence on the rate of caries progression in primary and permanent teeth.

2.3.1. Timing of tooth emergence

It is well established that the emergence of permanent teeth tends to occur earlier in girls than in boys, that most mandibular teeth emerge before their maxillary counterparts and that there is little difference in the age of eruption between contralateral teeth.[10,11,13-16]

2.3.2. Permanent molar teeth

There are two distinct phases of permanent tooth emergence in children: the first phase comprises the emergence of the incisors and the first permanent molars; the second phase comprises the emergence of the permanent canines, premolars and second molars. The average (mean) age for emergence of the first permanent molars reported in prospective longitudinal studies is 6.1[13] to 6.4[11] years for girls and 6.3[12] to 6.5[14] years for boys. The average (mean) age for the emergence of the second permanent molars is 11.3[12] to 12.1[11] years for girls and 11.8[11] to 12.4[14] years for boys. However, the average age for emergence conceals a wide variation between individuals. A longitudinal study from Northern Ireland found that the age range for first permanent molar emergence was from age 5 to 8 years. The age range for second permanent molar emergence was even wider – from age 9 up to age 14 or 15.[11] A similarly wide age range for emergence of molars has also been reported in other longitudinal studies from Europe.[12,13] Analysis of cross sectional national survey data from over 17,000 children in the Republic of Ireland provides evidence of the variability in the age for emergence of the permanent molars among children in Ireland, ranging from age 4.5 to age 8 years for first permanent molar emergence and between age 9.4 and 13.6 years for second permanent molars.[51]

In addition, a large-scale survey of 5-year-old children in the North East[48] reported that 19% of children in Junior Infants class had at least one first permanent molar present – which is 2-3 years earlier than the age at which many children receive their first oral health assessment through the School Dental Programme.

It is important to note that in most studies on tooth emergence, the appearance of at least one cusp of the tooth is all that is required for a tooth to be recorded as emerged or erupted. Only one study has measured the duration of eruption, i.e. time from first appearance of some part of the tooth to functional occlusion (firm contact). The average duration of eruption was approximately 15 months (range: 5–32 months) for first permanent molars and 27 months (range: 9–45 months) for second permanent molars.[12]

Based on the evidence on the timing and duration of molar emergence, it is clear that due to the individual variability in emergence times, there is no single 'milestone' age for assessing children that would identify all children likely to benefit from preventive or treatment services. Rather, there are key *periods* during which children's oral health and development should be monitored.

2.3.3. Maxillary canines

After the third molar, the maxillary canine is the most frequently impacted tooth, with a reported frequency of impaction of between 0.8% and 2.8%.[71] Eighty-five per cent of impacted canines are displaced palatally and the remaining 15% are buccally placed. The condition is twice as common in girls as in boys.[71] The main risk associated with impacted canines is resorption and possible loss of the adjacent permanent incisor teeth. The reported prevalence of incisor root resorption associated with ectopic maxillary canines ranges from 12.5%[72] to 67%.[73] Failure to diagnose and manage the ectopic maxillary canine efficiently can result in more complex, invasive and costly remedial treatments being required. A longitudinal study of the emergence of permanent teeth in Belfast children found that the mean age of emergence of maxillary canines was 11.18 years (range: 8.04–14.62 years). A radiographic study of the eruption path of maxillary canines in three dimensions showed that in the lateral plane, the canines showed a significant movement in a buccal direction between 10 and 12 years of age.[74]

A recent guideline from the Royal College of Surgeons Faculty of Dental Surgery (RCS FDS) on the management of the palatally ectopic maxillary canine[28] states that clinicians should suspect canine displacement if:

- the tooth is not palpable in the buccal sulcus by the age of 10–11 years
- palpation indicates an asymmetrical eruption pattern, or
- the position of the adjacent teeth implies a malposition of the permanent canine.

The RCS FDS guideline recommends clinical inspection and buccal palpation of the alveolus in the canine region annually from the age of 8 years. Radiographic examination is recommended, and although the guideline states that the horizontal parallax technique is more reliable than vertical parallax in localising unerupted canines, instructions are given for both. The guideline also states that radiographic procedures before the age of 10–11 years are usually of little benefit in terms of knowledge gained.[28]

Summary

During the period from school entry to early adolescence, the mouth undergoes constant change and development. The individual variation in the timing and duration of emergence of permanent molar teeth highlights the need for school-aged children to have access to on-going oral health assessment so that potential problems can be identified and addressed promptly. The periods between age 5–7 years and age 10–14 years are the most crucial for regular assessment to prevent and treat caries and to monitor oral development, and correspond with key caries risk age groups of 5–7 years and 11–14 years identified in the literature.[75]

2.3.4 Caries progression and frequency of oral health assessment

Although the pit and fissure surfaces of molar teeth account for most of the decay experience of children and adolescents, there is a lack of current evidence on the rate of caries progression on occlusal surfaces. Most of the literature on caries progression relates to approximal lesions in permanent teeth of children and adolescents. These studies are often conducted in low-caries populations with access to comprehensive oral health care, which limits the applicability of the findings to other populations and settings. There are no recent data on caries progression in Irish children.

The guideline on dental recall from the National Institute for Health and Clinical Excellence (NICE)[27] noted the limited quantity and variable quality of the available literature on caries progression and the considerable heterogeneity between studies, which limited the conclusions that could be drawn from the body of evidence. The additional studies identified for this guideline had the same limitations. Based on the NICE guideline and the additional evidence identified in the search conducted for this guideline, the Guideline Development Group made the following broad and general conclusions:

- The majority of approximal caries lesions progress slowly, and large numbers of lesions remain unchanged for long periods.[19] Several longitudinal studies involving adolescents and young adults have reported that 60% or more of approximal enamel lesions survive 3 to 5 years without progressing into dentine.[17,18,20,25,26,76] However, some lesions can progress rapidly: in one study of Australian adolescents, 10% of enamel lesions had progressed into dentine within 10 months.[17]

- Approximal lesions that extend to the enamel dentine junction (EDJ) or into dentine progress at a faster rate than enamel lesions (median survival time approximately 3 years).[18,20]

- Age and baseline caries experience are important factors influencing the rate of caries progression:

    - The rate of progression of caries lesions from enamel into dentine on the mesial of the first permanent molar is 4 times higher for age 6–12 years than for age 11–22 years.[21]

    - For all approximal permanent tooth surfaces studied, the rate of lesion progression is 2–3 times higher during early adolescence (age 12–15 years) than during early adulthood (age 20–27 years).[22]

- The risk of developing new approximal lesions is higher in children with higher baseline caries levels.[17,18,23]

- The rate of progression of enamel lesions is slower in populations and individuals with exposure to fluoridated water.[17,24]

- The limited data available on lesion progression in primary teeth, suggest that the rate of progression in primary teeth is faster than in permanent teeth.[21,25]

- Caries rates and survival times vary considerably between different surfaces and different teeth in adolescents. Distal surfaces, particularly those of the first permanent molars and second premolars, seem to experience a higher incidence of enamel lesions during adolescence[17,20,77] while the mesial surface of upper second molars, along with the distal surfaces of first permanent molars and premolars, experience high rates of caries progression from enamel to dentine.[17,20]

2.3.5. Recommendations on the timing and frequency of oral health assessments

The evidence on the timing of tooth emergence and the changing pattern of caries development on different teeth and tooth surfaces over time highlights the need for regular oral health assessment for children and adolescents, with intervals between assessments based on an assessment of the child's risk for caries and tailored to the child's individual needs.

While this guideline focuses only on school-aged children, it is important to remember that the foundations for good oral health are established in early childhood. An earlier guideline in this series – *Strategies to prevent dental caries in children and adolescents*[7] – has recommended that oral health assessment should be incorporated into general child health services, so that high caries risk children can be identified as early as possible and referred to dental services. That guideline also recommends population-level oral health promotion interventions for preschool children (such as oral health education at child developmental visits), the incorporation of oral health messages into relevant general health promotion interventions for young children as part of a common risk factor approach to improving oral health in this age group, and a dental assessment for all children during their first year in primary school.

Recommendation

➢	To optimise effectiveness, an oral health assessment programme for school-aged children should operate against a background of: a) Population-level oral health promotion strategies b) Integrated primary health care services for children, to allow early identification and referral of high caries risk preschool children into dental services[7]	**D**

The appropriate recall interval between oral health assessments has been the subject of much debate in recent years. Declining levels of caries in many countries has led to a move towards extending

recall intervals in order to reflect current oral health needs while at the same time optimising resource use.[78,79,80] Three systematic reviews of the benefits and harms of different dental recall intervals concluded that there was insufficient evidence to support or refute the practice of the traditional 6-monthly routine check-up, which has been the mainstay of dental practice since the last century,[80,81] or indeed any other 'one-interval-fits all' recall interval.[82]

The *Dental Recall* guideline from the National Institute for Health and Clinical Excellence (NICE)[27] which has formed a statutory part of the NHS dental contract since 2006, recommends that the interval between oral health assessments should be determined specifically for each patient and tailored to meet his or her needs, on the basis of an assessment of disease levels and risk of or from disease. In accordance with this approach, a Caries Risk Assessment Checklist (Appendix 4) has been developed specifically to assist clinicians in assessing the individual caries risk of children in Ireland. A documented, formal caries risk assessment is an important component in developing an appropriate oral health care plan for each child, and a baseline risk assessment conducted at school entry allows changes in risk status to be monitored over time. Further information on how the Checklist was developed is contained in the guideline *Strategies to prevent dental caries in children and adolescents,* available at http://ohsrc.ucc.ie/html/guidelines.html.

Recommendation

➢	All children should be offered an oral health assessment, including a formal caries risk assessment, during their first year in primary school[7]	**D**

The NICE dental recall guideline[27] recommends a maximum interval of 12 months between oral health assessments for children under the age of 18, based on consideration of the more rapid rate of caries progression in children compared to adults and the need to lay the foundation for life-long oral health through reinforcing and promoting good oral health at regular intervals. It is important to note that a maximum recall interval of 12 months represents a doubling of the traditional recall interval in the UK, whereas it represents less than half of the current interval between oral health assessments in the School Dental Programme. The most recent national data on the oral health of children in the Republic of Ireland showed that caries levels among 12- and 15-year old children in Ireland were substantially higher than those of children in the UK.[37] Based on caries levels alone, this would suggest that in order to promote, protect and improve the oral health of children in Ireland, the interval between oral health assessments should not exceed 12 months.

Recommendation

➢	To promote, protect and improve children's oral health from school entry onwards, the interval between oral health assessments for school-aged children should not exceed 12 months.[27] *The recall interval for individual children should be informed by the Caries Risk Assessment, and children who are considered high caries risk may need a shorter recall interval.*	**GPP**

3. Best practice for oral health assessments

3.1 School-linked approach

The delivery of state-funded dental services to children has always been linked to schools, in that oral health assessments are offered to children in specific classes. The Public Dental Service uses class lists provided by the schools as its annual database of children in the target classes. Schools also facilitate the distribution and return of consent forms, if used. The Guideline Development Group discussed alternatives to the current school-linked method of accessing children for oral health assessments, such as individualised, age-based recall appointments. However, offering oral health assessments to school classes as part of a rolling programme has the advantage of being administratively simple and currently provides the most reliable way to collect information on the uptake and outcomes of the School Dental Programme. The school-linked approach to providing oral health assessments gives every child an equal opportunity to be offered an assessment; it ensures that children are not lost from the system if they change address or school and that any new school entrants are picked up, since the school roll is revised annually. The minority of children who are home-schooled will not be included in this system, therefore it is important that all parents are made aware of the School Dental Programme so that the parents of home-schooled children can register their child for oral health assessment.

➢	A school-linked approach to offering oral health assessments should be maintained and strengthened.	**GPP**

The support of the school is vital to fostering an effective and efficient school-linked oral health assessment programme. Good communication between the Public Dental Service, schools and parents is essential at all stages, to ensure that schools and parents understand what they can expect from the School Dental Programme.

A full class list, ideally with full and up-to-date contact details, is required each school year in order to administer and evaluate the programme. When HSE dental services request a class list with contact details from schools, it is advised that they should cite the legal basis for the request (Health Act 1947 (Section 26) and Sections 66 & 67 of the Health Act 1970 which permit the provision of facilities by schools for specified inspections) in order to allow schools to ensure that they are complying with their data protection responsibilities. From a transparency perspective, schools would still be expected to inform parents at enrolment stage that their contact details may be made available for these purposes (Personal communication, Office of the Data Protection Commissioner). For more details on obtaining class lists, please see Appendix 5.

While working from a full class list is recommended best practice, sometimes a school may not provide all the required information. In this situation, the necessary information must be collected through a consent form distributed via the school. A sample consent form can be found in Appendix 6.

3.2. Who should conduct oral health assessments?

Current regulations require that the school oral health assessment must be carried out by a dentist; other oral healthcare professionals are not allowed to undertake these assessments.

3.3. Procedure for oral health assessments

Note: The following sections (up to 3.3.3) have been adapted with permission from the Scottish Dental Clinical Effectiveness Programme guidance on the Prevention and management of caries in children.[9]

When the child attends the clinic it is important to:

- ✓ Agree whether it will be the dentist or the dental nurse who will have the primary responsibility for welcoming the child or family into the surgery.
- ✓ Welcome the child as they enter the surgery by:
    - ✓ Making eye contact
    - ✓ Greeting them with their name
    - ✓ Saying something to make them smile
- ✓ Gain rapport with the parent/carer
- ✓ Involve the child as much as possible in all conversations and do not 'talk over' them.

For all children, a full medical, dental and social history should be taken. Key information to be collected/confirmed include:

- Child's full name, address, PPSN, date of birth, school, class
- Name of parent/guardian and contact numbers
- Name and address of GP and family dentist (if any).

A caries risk assessment should be completed for each child. The Caries Risk Assessment Checklist (Appendix 4) uses the dentist's assessment of the balance between risk factors and protective factors for dental caries in a particular child to decide if that child is high caries risk or not. It contains both clinical and non-clinical elements. Information on the non-clinical elements such as type of fluoride toothpaste used, frequency of brushing, type of water supply and dietary habits can be collected at the same time as the medical, dental and social history. The history and caries risk assessment together provide essential information for developing an oral health care plan for the child.

3.3.1. Involving the parent in the oral health assessment

The Caries Risk Assessment Checklist provides an opportunity to involve the parent in their child's oral health. Time invested in building rapport with the parent is as important as the time spent with the child. Guiding the parent or carer to recognise their central role in their child's oral health and what this involves can sometimes be difficult. For example, they might be feeling stress because of apprehension or even feelings of guilt. The dental team needs to be sensitive to the social, educational, health-related and economic factors that can make it difficult for parents to establish and maintain healthy behaviours for their child. Therefore, when advising the parent/carer of their key role in improving their child's oral health, each dental professional needs to be aware of these factors and be empathetic, non-judgemental and supportive. The parent/carer's active participation in the child's

oral health is essential. All members of the dental team, including the receptionist and the dental nurse, have an important role in gaining rapport.

3.3.2. Clinical oral health assessment

For each child, a comprehensive clinical examination including a full extra-oral and intra-oral examination should be undertaken. The dentist must always be alert to the possibility of non-accidental injury, dental neglect or other indicators of possible child abuse, and should be familiar with national guidance for the protection and welfare of children[83,84] as well as local guidelines and procedures that may be in place. As health care workers, all members of the dental team have a duty of care to safeguard the safety and well-being of every child. If there is concern about the parent's ability and motivation to care for their child's oral health, every opportunity should be taken to provide multidisciplinary support to improve this. Some parents/carers need additional support and encouragement to be able to accept responsibility for their child's oral health and to actively participate in their child's oral health care.

Extra-oral

- Check for facial swelling, asymmetry, swollen submandibular, sub-mental and cervical glands.

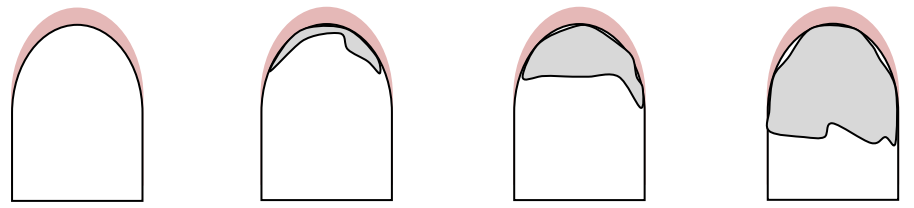
Intra-oral

Soft tissues

- Check soft tissues (lips, cheeks, tongue, floor of mouth, tonsils). Record presence or absence of abnormalities.

Oral hygiene

- Assess plaque levels on anterior and posterior teeth. Plaque levels give a good indication of toothbrushing habits and it is useful to monitor these over time. A quick and simple method of recording plaque levels is presented in the guidance *Prevention and management of caries in children.*[9] Plaque levels are recorded in terms that a child will understand, by scoring out of 10, as shown in below.



Perfectly clean tooth:	Line of plaque around the cervical margin:	Cervical 1/3rd of crown covered:	Middle 1/3rd of crown covered:
10/10	**8/10**	**6/10**	**4/10**

The worst score in each sextant is recorded, for example:

	BACK Teeth **R**	FRONT Teeth	BACK Teeth **L**
TOP Teeth	8/10	4/10	8/10
BOTTOM Teeth	8/10	6/10	6/10

Trauma

- Check upper and lower incisors for discoloration or fractures involving dentine and record findings.

Tooth wear

- The term 'tooth wear' is an all-encompassing term used to describe the non-carious loss of tooth tissue which may have occurred due to erosion, attrition or abrasion, and possibly abfraction.[85] There is evidence that tooth wear into dentine in primary teeth is associated with tooth wear in permanent teeth.[85] Therefore, it is important to record the presence of tooth wear in both dentitions so that the condition can be monitored and appropriate advice given. There is, as yet, no universally accepted index for recording tooth wear. Therefore it is proposed that the presence of tooth wear should be recorded only for the tooth or teeth affected, and should include the site (buccal/facial, occlusal/incisal, palatal/lingual) and the extent (confined to enamel, involving dentine).

Caries

- Teeth should be clean, dry and well illuminated for clinical examination.
- Carry out a meticulous surface-by-surface examination for caries.
- Record all caries present, including enamel caries (white and brown spot lesions without cavitation) as well as dentinal caries, restorations and sealants.
- Do not use a probe for diagnosing caries in pits and fissures: forceful use of a probe can damage tooth surfaces.[86-88]
- Check for evidence of sepsis in the oral cavity (look for sinus, check if tooth is tender to percussion or mobile).
- If in doubt whether caries is present, the use of additional caries detection methods, e.g. bitewing radiographs or fibre optic transillumination should be considered.

Other pathology

- Record any other pathology or dental anomalies, e.g. hypoplasia, Molar Incisor Hypomineralisation (MIH), hypodontia, supernumeraries, enamel opacities.

3.3.3. Dental radiographs for caries detection

The use of ionising radiation in dentistry carries both benefits and harms. The overriding justification for any exposure to ionising radiation for dental purposes must be that the total potential diagnostic benefit to the patient outweighs the potential risks.

The use of bitewing radiographs as an adjunct to the visual detection of caries, particularly on approximal surfaces, is a well-established part of dental practice. More carious lesions are found when bitewing radiography is added to the clinical visual examination, with the benefit reported ranging from 167% to 800% of the yield from clinical diagnosis for high caries risk children and from 150% to 207% for children with a moderate caries risk.[89] However, many of the studies reporting these values are over 15 years old, and the diagnostic yield from bitewing radiographs is influenced by a number of factors such as the thoroughness of the clinical examination, the caries risk status of the individual and technical issues.[90]

Several guidelines on the use of radiographs in dentistry offer recommendations on patient selection criteria for dental radiography and suggest intervals between bitewing examinations for patients, based on an assessment of individual caries risk.[89,91-93] *Radiation protection 136, European guidelines on radiation protection in dental radiology*[93] provides general guidelines on the safe use of radiographs in dental practice and includes recommendations relating to selection criteria for dental radiographs. The European Academy of Paediatric Dentistry has also produced a guideline on the use of radiographs in children.[92] A summary of the recommendations these guidelines can be found in Appendix 7.

3.3.4. FOTI for caries detection

Fibre-optic transillumination (FOTI) uses the principle of light scattering to increase contrast between normal and carious tooth substance. Light is applied to the side of the tooth and its transmission observed from either the opposing side or occlusally, in the case of molars and premolars. As light is scattered more in demineralised enamel than in sound enamel, a lesion appears dark on a light background. In addition, carious dentine appears orange, brown or grey underneath the enamel and this can significantly aid discrimination between enamel and dentinal lesions.[94] To facilitate light transmission through the tooth, high-intensity illuminators are required. To detect smaller lesions, particularly approximal lesions, point sources of illumination are desirable. The introduction of high-intensity LED light sources has provided a cheap and more widely available source of equipment. FOTI is non-invasive and does not use ionising radiation. Its use is recommended in caries detection but, as with all adjuncts to visual caries detection, training is required for optimal use of FOTI.[94]

3.3.5. Orthodontic assessment

Assessment of the emergence and alignment of permanent teeth should be part of every oral health assessment during the mixed dentition phase to allow timely identification of problems such as delayed or ectopic eruption and malocclusion. Although active intervention may not be needed or appropriate, or the developing malocclusion may not meet the referral criteria for state-funded orthodontic services, it is important to record and monitor the developing occlusion and to discuss this aspect of the child's oral health with the parent/carer at each assessment. From age 8, the buccal

sulcus should be palpated for the presence of canines. Taking into account the child's general dental development (there may be a lag between chronological age and dental age), follow-up and/or radiographs should be considered if the canines cannot be palpated by age 10-11. Between ages 10 and 12, children should be assessed for orthodontic treatment need according to HSE guidelines. Parents of children who qualify for referral to the HSE orthodontic waiting list should be informed of the current waiting time.

3.3.6. Individual oral health care plan

The outcome of the oral health assessment should be discussed with the parent and child. Based on the assessment, an individual oral health care plan should be developed that is appropriate to the child's needs and takes into account the child's ability to co-operate with treatment. Caries-preventive measures for each child should be in accordance with the guidelines *Strategies to prevent dental caries in children and adolescents*[7] and *Pit and Fissure sealants*[8]. These measures should include, oral health education for all children, to encourage good dietary and toothbrushing habits, and application of fluoride varnish and fissure sealants for children assessed as being high caries risk (Table 3.1).

Table 3.1: Recommendations for caries prevention as part of an individual oral health care plan

	All children	High caries risk
Caries prevention	Encourage: • Healthy eating in line with national dietary guidelines • Limiting consumption of sugar-containing foods and drinks and, when possible, confining their consumption to mealtimes • Use of fluoride toothpaste containing at least 1,000 ppm F, twice a day – at bedtime and at one other time during the day. Spit out toothpaste after brushing and do not rinse • Use of sugar-free medicines, when available[7]	• Apply fluoride varnish every 6/12 or 3/12 • Apply and maintain resin-based fissure sealant to first and second permanent molars • If moisture control is inadequate for resin-based sealant application, apply fluoride varnish or consider glass ionomer as an interim sealant[8]

4. Data collection and Audit

Two recent reviews[32,33] of the Public Dental Service noted the lack of standardised data collected by the Public Dental Service about the School Dental Programme and the lack of defined health outcomes, both of which are necessary for evaluating the effect of the programme on children's oral health. The recommendations in this guideline have considered the setting, frequency and procedure for conducting oral health assessments and provide a framework against which their quality and effectiveness (in terms of oral health improvement) can be measured.

Standardised data should be collected locally and collated nationally, to allow comparison of the effect of the programme between areas and also to produce a national picture of the outcome of the Oral Health Assessment Programme. In keeping with the key developmental milestones identified in this guideline and with consideration for the key ages selected for epidemiological surveys, the tables below identify the key data suggested for local collection.

Age 5–7 (Junior Infants to 1st class)

Local Data Collection

Process measures

- Number and percentage of children in each class receiving an oral health assessment
- Number and percentage of children in each class assessed as high caries risk using the Caries Risk Assessment Checklist
- Number and percentage of children receiving recommended preventive care (e.g. OHE, fluoride varnish, fissure sealants)
- Number and percentage of children with a recall interval of 12 months or less

Oral health outcome measures (Age 5)

- Number and percentage of children with caries in primary teeth
- Number and percentage of children with 3 or more decayed missing or filled primary teeth
- Mean dmft/s

**Threshold of >2 dmft is used in the Caries Risk Assessment Checklist as one of the indicators of high caries risk status for age 5–6 years*

Oral Health Goal

- Reduction in the prevalence and severity of caries experience at age 5
- Reduction in number and percentage of children requiring dental general anaesthesia (age 5–7)

These data provide a measure of the 'baseline' oral health need in a local area, which can be used for planning targeted population preventive programmes in particular high-caries 'blackspots'. The trend over time in the percentage of children assessed as high caries risk could be used as an indicator of the effect of preventive measures targeted at preschool children in such areas. The oral health goals would be a reduction in the percentage of children with caries experience in primary teeth at age 5, reduction in the severity of caries experience (mean dmft/s) and a reduction in the number and percentage of children requiring dental general anaesthesia over the first key developmental milestone period of age 5–7 years.

Age 8–9 (2nd and 3rd class)

Local Data Collection

Process measures

- Number and percentage of children in each class receiving an oral health assessment
- Number and percentage of children in each class assessed as high caries risk using the Caries Risk Assessment Checklist
- Number and percentage of children receiving recommended preventive care (e.g. OHE, fluoride varnish, fissure sealants)
- Number and percentage of children with a recall interval of 12 months or less

Oral health outcome measures (Age 8)

- Number and percentage of children with caries experience (i.e. untreated caries, filling or extraction due to caries) in one or more first permanent molars
- Number and percentage of children with fissure sealant on first permanent molars
- Number and percentage of children with trauma to permanent incisors

Oral Health Goal

- Reduction in the number and percentage of 8-year-old children with caries experience in a first permanent molar tooth
- Reduction in number and percentage of 8-year-old children with one or more first permanent molars extracted due to caries.

Regular oral health assessment of children from school entry should reduce the prevalence of caries experience in permanent teeth of 8-year-olds from the 22% reported in the North South survey.[95] Continuation of regular oral health assessments into adolescence should see an improvement in the overall caries experience at ages 12 and 15 and a reduction in the proportion of children with caries experience in permanent teeth. The number and percentage of children experiencing extraction of

permanent teeth due to caries was considered by the Guideline Development Group to be an important indicator of the failure of the preventive aim of the Programme. Consequently of a specific oral health goal was suggested to reduce the number and percentage of children experiencing extraction of permanent teeth.

Age 10–15 (4th class to 2nd year)

Local Data Collection

Process measures

- Number and percentage of children in each class receiving an oral health assessment
- Number and percentage of children in each class assessed as high caries risk using the Caries Risk Assessment Checklist
- Number and percentage of children receiving recommended preventive care (e.g. OHE, fluoride varnish, fissure sealants)
- Number and percentage of children with a recall interval of 12 months or less
- Number and percentage of children receiving an orthodontic assessment (age 10–12)
- Number and percentage of children meeting HSE orthodontic referral criteria (age 10–12)
- Number and percentage of children having bitewing radiographs taken
- Number and percentage of children with fissure sealant on permanent molars
- Number and percentage of children with trauma to permanent incisors

Oral health outcome measures (Age 12 and 15)

- Number and percentage of children with one or more permanent teeth extracted due to caries
- Number and percentage of children with caries experience in permanent teeth
- Mean DMFT/S

Oral Health Goal

- Increase in detection of impacted canines
- Reduction in the prevalence and severity of caries experience at age 12 and 15
- Reduction in untreated trauma

4.1. Clinical audit

Clinical audit is part of best practice and should be introduced to assess the quality of the procedure of oral health assessment, to ensure that no oral health condition is overlooked, and that appropriate additional diagnostic tools such as radiographs or FOTI are used in the assessment process. Audit of the quality of radiographs has become a required part of dental practice, and the introduction of clinical audit for a sample of children examined by each clinician in a clinic would be another step towards ensuring the quality of assessment and the appropriateness of oral health care plans.

5. Implementation

The recommendations in this guideline present a best-practice approach to providing a programme of oral health assessments to school-aged children as part of a state-funded service. The international overview of different systems of oral health services for children coupled with the best available evidence on the key milestones in the oral development of children have informed the decisions of the Guideline Development Group. In the process of developing this guideline, it became apparent that current practice for providing oral health services for children is removed from what the evidence suggests is best practice. Consequently, the recommendations in this guideline potentially pose challenges for implementation.

Two reviews[32,33] have highlighted the lack of an oral health policy and national priorities to guide the activities of the Public Dental Service. This guideline has been developed in the same vacuum. Although the Health Service Executive is currently undergoing a challenging period of change and constraints due to financial restrictions, the recommendations in this guideline are robust and can be applied regardless of how state-funded dental services for children may be configured in the future. The application of the recommendations, to the entire population or to selected priority groups within the population, in full or as part of a phased implementation plan, are policy decisions that lie outside of the remit of this guideline.

The recommendations in this guideline, together with those of the other three evidence-based guidelines developed for the Public Dental Service, provide a best-practice framework for radically overhauling and improving the way state-funded oral health services for children are provided. The suite of guidelines offers an evidence-based approach to improving children's oral health and quality of life. Implementation of these guidelines, in the medium term, will reduce demand on secondary care services such as dental general anaesthesia and, in the long term, has the potential to improve oral health and quality of life into adulthood by promoting effective self-care, which is the foundation of good oral health throughout life.

6. Recommendations for research

This guideline focuses on increasing the effectiveness of the oral health care delivery system for children. The need for change is urgent and important. The potential health and quality of life gains from effective implementation of the guideline are substantial for children and can, over time, carry over into adulthood. Implementation of this guideline's recommendations affords the opportunity to measure the economic inputs and outcomes alongside the health and social gain – something that heretofore has not been possible. It is only by establishing this baseline evidence that we will have a

platform from which to consider any change to the recommended annual interval between oral health assessments for children in Ireland.

Evaluation of the economic and health impact of the proposed changes should incorporate short, medium and long term health and quality of life outcomes and be explored from the perspectives of the consumer (child and parent/guardian in the short to medium term; adult in the long term), the employer, the State and society in general.

Research is required in the following areas:

Short term

- Evaluation of the impact of a first oral health assessment for school children at age 5 (Junior Infants) compared to a first oral health assessment at age 8 (2nd class) on caries experience in primary teeth and in first permanent molar teeth and on service utilisation at age 8.

- Evaluation of the Caries Risk Assessment Checklist for identifying high caries risk individuals and for tailoring recall intervals to risk status.

Long term

- Evaluation of the impact of a programme of annual oral health assessment from age 5 (Junior Infants) on caries experience at age 12 (6th class) compared to the traditional approach of offering oral health assessment to children at age 7 or 8 (1st or 2nd class), age 10 (4th class) and age 12 (6th class).

- Economic evaluation of a programme of annual oral health assessment from age 5 (Junior Infants) compared to the traditional approach of offering oral health assessment to children at age 7 or 8 (1st or 2nd class), age 10 (4th class) and age 12 (6th class).

- Exploration of the key dataset to allow population-level adjustments to the maximum recall interval for children and adolescents.

Appendix 1: Overview of international Oral health care systems for children

Europe

The following description of oral health care systems in Europe is taken from the 2009 *EU Manual of Dental Practice.*[96]

There is variation throughout Europe in how dental care for children is provided and in the skill-mix available to provide that care. Typically in the Nordic countries (Denmark, Finland, Sweden and Norway), there is a large public dental service and comprehensive care is provided for children from an early age up to age 18 or 19. The uptake of this service is generally very high (> 90%). School-based dental assessment is not carried out in any of these countries.

In countries where dental services for children are provided through private practitioners through a social insurance scheme (e.g. Belgium, France, Germany, Austria) school-based dental assessment may be undertaken for certain school classes, in order to notify parents of the need to take their child to the dentist. In the UK, where dental care for children under the age of 18 is provided free of charge by general dental practitioners through the National Health Service, there has been a long history of school-based dental assessment. Following the publication of a large-scale randomised controlled trial in the north west of England which found that school dental screening did not improve dental health in the target population and tended to exacerbate social division in health service utilisation,[57,65] the UK Department of Health advised Primary Care Trusts to review their screening programmes, due to the lack of evidence to support population screening for dental disease.[66] The Department of Health guidance added that if school screening was to be undertaken, then positive consent for participation would have to be obtained.

In Scotland, parents can access dental treatment services for children through general dental practitioners with a contract with the National Health Service, and dental care is free for children under the age of 18. In addition to this, a National Dental Inspection Programme (NDIP) provides school-based dental assessments for children at school entry (Primary 1) and at the end of primary school (Primary 7). The purpose of the NDIP is twofold:

- To inform parents of their child's oral health status so that they can take necessary steps to remedy any problems that may have arisen
- To monitor children's dental health at national and regional levels so that reliable oral health information is available for planning and for evaluating initiatives directed towards improvements.

The Inspection Programme has two levels: a *Basic Inspection* (intended for all children in Primary 1 and Primary 7 classes) and a *Detailed Inspection* (for a representative sample of a specific age group in alternate years to assist in planning). Basic Inspection, which involves a simple assessment of the mouth of each child using a light, mirror and ball-ended probe, is conducted annually by the Community Dental Service for children in Primary 1 (school entry) and Primary 7 (primary school exit). The aim of the Basic Inspection is to inform parents of their child's oral health needs, so that they can

arrange necessary treatment. The treatment needs of each child are assigned to one of three categories (Table A1) and the corresponding letter is issued to the parent. Data from the Basic Inspection are anonymised and aggregated and information on the percentage of children in each category is produced regionally and nationally. These data are used to monitor the impact of local and national oral health improvement programmes, and to assist in the development of local dental services.[67]

Table A1: Categories of oral health needs issued by letter to parents from Scottish Basic Dental Inspection in schools

Letter A	Should seek immediate dental care on account of severe decay or abscess.
Letter B	Should seek dental care in the near future due to one or more of the following: • Presence or history of decay • Broken or damaged front tooth or tooth wear • Poor oral hygiene • May require orthodontics (Primary 7 only).
Letter C	No obvious decay experience but they should continue to see the family dentist on a regular basis

In addition to the Basic Inspection, a Detailed Inspection is also conducted, on alternate years, for children in Primary 1 and Primary 7. The Detailed Inspection is a more rigorous and comprehensive assessment that involves recording the status of each surface of each tooth in accordance with international epidemiological conventions. The goals of the Detailed Inspection are to determine, in detail, the current levels of established tooth decay experience and the impact of deprivation on the dental health of children in the target class. The Detailed Inspection is conducted by trained and calibrated dentists using the criteria of the British Association for the Study of Community Dentistry (BASCD) for recording caries at dentinal level.

A summary of the arrangements for dental care for persons under the age of 18 in Northern and Western Europe is shown in Table A1.

Table A1: Dental care for children and adolescents in Western and Northern Europe

Country	Services for children and adolescents under the age of 18
Austria	There is no organisation entirely dedicated to children's dental care. Children are covered by the social sickness insurance of their parents (99% of population covered). There are institutions in every county which offer caries prevention programmes, which are mostly educational.
Belgium	Almost all dental care is provided in private practice. Healthcare is mainly funded by deductions from salaries. The amount contributed depends on income. There are two different schemes: one for the employed which provides full cover, and another for the self-employed. Dentists generally charge patients for each item of treatment, and then patients reclaim a proportion of the fees from their sick fund. However, a 'third party payment system' also exists, where some dentists choose to receive reimbursement directly from the sick fund.
Denmark	Dental care including orthodontics is free up to the age of 18 and is usually delivered in municipal school dental clinics manned by salaried public dentists. It is estimated that 99% of the children and adolescents utilize this service. Since January 2004 children have been able to choose to receive dental care from a private practitioner instead of the service provided by the Kommune, but have to pay 35% of the costs. At the age of 16 children may change to a private practitioner with the full cost of treatment still being met by municipalities until they are 18 years old. In several kommuner, in more rural areas, the Kommune contracts with local private practitioners to treat the children.
Finland	All children under the age of 18 are entitled to free care in the public dental service. Only 1% of children attend privately.
France	Oral health care is predominantly private. A mandatory national health insurance system covers the entire population and reimburses about 70% of fees paid on a fee per item basis. Children and teenagers aged 6, 9, 12, 15 and 18 can benefit from a prevention examination covered 100% by health insurance (mandatory at age 6 and 12).This examination is directly paid to the dentists by the Caisse. The necessary care (conservative treatment and sealants) are free as well. There is no nationally organised public dental service
Germany	There is a long established insurance-based healthcare system of 'sick funds', which are not for profit organisations. Almost 90% of the population belong to one of the 355 funds. There is also wide use of private insurance. Dental fees, both inside and outside sick funds and insurance-based care are regulated. There is a public dental service to oversee and monitor the healthcare of the total population. The care provided is restricted to examination, diagnosis and prevention.
Greece	Oral healthcare, besides preventive services offered free by NHS clinics to all children, is almost entirely provided by private practitioners, with patients paying the total cost of care. The Social Security pays 75% of the dental care for children up to 16 years of age; the parents have to pay the balance.
Iceland	The national dental health insurance scheme offers partial reimbursement of the cost of dental treatment for children under 18. For children under 18, 75% (according to the public fee schedule) of the cost of most dental treatment is reimbursed with the exception of crowns, bridges and orthodontic treatment. Reimbursement of up to €1,272 for orthodontic treatment is available under special rules. There is no public dental service.
Ireland	All children up to their 16th birthday are entitled to care from the HSE Dental Service. However, pre-school children receive what amounts to an advisory service with emergency dental care available on demand. Schoolchildren are targeted in schools in certain classes each year for preventive advice and are screened or examined depending on the resources available to their Local Area Service. Their outstanding treatment need is addressed at that point. The overall strategy is based on this targeted approach together with the application of fissure sealants on first and second permanent molar teeth.
Italy	Predominantly private with no insurance schemes. The Public Dental Service exists to a varying extent in most regions as an alternative to private practice. Theoretically, all groups in society are eligible to attend the service, but in reality it is largely used by the lower middle class, who cannot afford private care. In a few regions, school screening programmes have been introduced, together with some prevention and oral health promotion. In general, these activities are exceptional and not standard.
Luxembourg	Medical and dental insurance is obligatory and covers 99.9% of the population. There is no structured public dental service.
The Netherlands	Almost all dentistry is provided by dentists working in general practice. Approximately 69% of the population is registered in the public system. Dental care in the basic care insurance package contains preventive and curative treatment of all juveniles up until their 21st birthday. There is no separate public dental service in the Netherlands. There is, however, a small dental service for schools which is run as a private business.
Norway	Children and juveniles under the age of 19 receive dental health care free of charge (except for orthodontics) from the Public Dental Health Service.
Portugal	There is a National Oral Health Promotion Programme which reaches children from age 3 to 16 years.
Sweden	The Public Dental Service (NDS) provides free dental care to children up to the age of 19. Children and their parents can choose to attend either the NDS or private practitioners.
Spain	Comprehensive health care is available to all by law, but dentistry is excluded. There is a small Public Dental Service which operates in Primary Health Care Units (Ambulatorios) managed by the regions. This only provides emergency care. Private care is freely available, however. The regional authorities have introduced a capitation system for children aged 6 to 14 years old.
United Kingdom	Combination of capitation and fees per item of treatment for patients aged from 0–17, covering prevention, simple restorations and extractions. Utilisation for those under 18 years is estimated at 60%.

North America

United States

In the United States, oral health care is mainly financed through private third-party health insurance schemes.[97] Medicaid is a government-funded social welfare scheme that provides health and medical services programmes for certain individuals and families with low incomes and few resources. All children enrolled in Medicaid are entitled to the comprehensive set of health care services known as Early, Periodic Screening, Diagnosis and Treatment (EPSDT), which includes dental services. Although oral screening may be part of a physical exam, it does not substitute for a dental examination performed by a dentist. Dental services for children must include, as a minimum:

- Relief of pain and infections
- Restoration of teeth
- Maintenance of dental health.

Dental services may not be limited to emergency services. Each state is required to develop a dental periodicity schedule in consultation with recognised dental organisations involved in child health. A referral to a dentist is required for every child in accordance with the periodicity schedule set by the state. The Children's Health Insurance Programme (CHIP) is another government scheme and provides health cover to children from families whose income is too high to qualify for Medicaid, but who cannot afford private coverage. States may opt to provide CHIP coverage by extension of the Medicaid scheme, in which case children covered by CHIP will be eligible for the EPSDT. States with a separate CHIP are required to include coverage for dental services "necessary to prevent disease and promote oral health, restore oral structures to health and function, and treat emergency conditions". States

may choose from two options for providing dental coverage: a package of dental benefits that meets the CHIP requirements, or a benchmark dental benefit package equivalent to the most popular federal employee dental plan or the coverage provided by the most popular commercial insurer in the state. Medicaid and CHIP provide health coverage to more than 31 million children, including half of all low-income children in the United States.

http://www.medicaid.gov [Accessed on 10/01/2012]

Canada

In Canada oral health does not come under the Canada Health Act, except for some oral surgical procedures that are done in hospitals. Ninety-five percent of oral health care services are provided on a fee-for-service basis in private dental clinics. The other 5% are delivered through publically financed and sponsored dental care programmes in the provinces or territories, and generally are directed at low-income groups. The level of coverage varies across the country.[98] In Ontario, the Healthy Smiles Ontario programme provides regular access to free dental care for children under the age of 18 from low income families, while public health programmes in Ontario are delivered to children aged 5 to 13

years and include screening (which is carried out by trained hygienists), referral, prevention and in some geographic locations, clinical care.

Dental screening is carried out in the school by dental hygienists who carry out a quick visual inspection using diagnostic criteria described in the Ministry of Health protocol. A mouth mirror and a tongue depressor are used for screening, which is defined as: "*a series of processes by which school children are examined briefly for dental disease and preventive needs. Children with serious dental problems are referred on for investigation and treatment."* Parents are notified if their child needs treatment, and these children are followed up to ensure the child receives treatment.[54] Legislation in Ontario requires public health departments to identify and ensure necessary care for children with preventive and urgent care needs. In addition, child welfare legislation stipulates that parental failure to ensure care for children with urgent needs constitutes child neglect and parents can be compelled to provide necessary care. The Children in Need of Treatment (CINOT) programme provides services and treatments for children whose parents/caregivers have no dental coverage and cannot afford the cost of urgent dental care.

A targeted system of school oral screening currently operates, whereby schools are ranked each year as high, medium and low risk based on the proportion of children in Grade 2 (age 7) with two or more teeth (primary and permanent combined) with untreated decay (d+D). In high risk schools, children in Junior and Senior Kindergarten, and Grades 2, 4, 6, and 8 are screened; in moderate risk schools, Junior and Senior Kindergarten, and in Grades 2 and 8 are screened; in low risk schools, only the two kindergarten classes are screened, in addition to Grade 2.[99] An evaluation of the targeted system of school screening, where the intensity of screening was based on the caries status of kindergarten classes rather than Grade 2, found that a targeted programme was successful at identifying children with needs who came from economically disadvantaged backgrounds. Between 70–80% of children with urgent needs in this category were identified. However, overall, 42% of children with urgent needs were missed.[54] We found no evaluation of the targeted system based on caries levels in children in Grade 2.

Australia:

Australia's National Oral health Plan 2004–2013 recommends children and adolescents receive at least one course of general oral health care every two years. Systems of state-funded dental care for children and adolescents vary throughout the continent.

Victoria

Children and certain adolescents are eligible for public dental services, which include a check-up every 1–2 years, sealants, cleaning and fillings. Dental treatment is free for children aged 12 and under if they or their parents are eligible for specified concession cards. A fee applies to children aged 0–12 whose parents do not hold a concession card. Children and adolescents without a concession card may be eligible for free treatment in some circumstances Waiting lists may exist for general dental care, but children and young people are a priority group for access. http://www.dhsv.org.au/public-dental-services/dental-services-available/ [Accessed on: 22/11/2011]

South Australia

The School Dental Service offers expert oral health care to eligible children at clinics throughout South Australia. This care is provided by teams of dentists, dental therapists, and dental assistants. All dental care is free for preschool children. A fee applies for each course of general dental care for school children and adolescents not covered by a concession card. Parents must enrol their child with the local School Dental Clinic. Teenagers aged between 12 and 17 holding a Teen Dental Voucher can attend a School Dental Clinic or private practitioner, but restorative treatment is not available in private practice under this scheme. http://www.sadental.sa.gov.au/DesktopDefault.aspx?tabid=34 [Accessed on: 22/11/2011].

Western Australia

School Dental Service provides free general dental care to school children throughout the state, ranging from pre-primary through to Year 11 and, in remote locations, to Year 12. Care is provided by dental therapists under the supervision of dental officers from fixed and mobile clinics located at schools throughout the state. The School Dental Service is primarily a public dental health program, with emphasis on prevention and education. The treatment is limited to general practice care and there are a number of exclusions, e.g. specialist services and general anaesthesia facilities. Treatment outside the scope of the School Dental Service is referred to other providers and any costs are the responsibility of the parent or guardian. http://www.dental.wa.gov.au/ [Accessed on: 22/11/2011].

Northern Territories

The Children's Dental Service provides free dental services to all children from infancy to the completion of primary school. Services are provided at primary school-based clinics in urban areas, community dental clinics and in regional and remote areas, at community health centres or in mobile vans. Services to children are generally provided by Dental Therapists and Oral Health Therapists. Eligibility criteria apply.

http://www.health.nt.gov.au/Oral_Health/Childrens_Dental_Services/index.aspx [Accessed on: 22/11/2011].

Queensland

All children from age 4 to Year 10 in school, regardless of income, are eligible for free dental services Child and Adolescent Oral Health Services (formerly School Dental Program). Children younger than four years of age and those who have completed Year 10 of secondary school are also eligible for publicly funded oral health care if they are dependents of current concession card holders or hold a current concession card themselves. Treatment is provided at schools in fixed or mobile dental clinics, but there is a move towards centralising treatment services at larger dental clinics in the District rather than being school-based. Schools are treated on a rotational basis. The frequency of recall varies between districts, but many districts can exceed the recommended one course of general dental care every 2 years. http://www.health.qld.gov.au/oralhealth/services/school.asp [Accessed on: 22/11/2011].

New South Wales

The range of oral health services provided through the NSW public health system broadly includes dental services to children and adults according to criteria that target emergency situations, those in most need, dental education and oral health promotional services. Children under the age of 18 who are normally resident within the boundary of the providing Area Health Service and are eligible for Medicare are eligible for free public oral health services. Additional eligibility criteria may apply for some specialist oral health services, such as orthodontic and general anaesthetic services. http://www.health.nsw.gov.au/cohs/health_services.asp [Accessed on: 22/11/2011].

New Zealand

Children in New Zealand are entitled to free basic oral health services from birth until their 18th birthday. Free dental care is provided to all children – from birth to Year 8 of schooling – at the school or community dental clinics. Dental therapists provide dental examinations, fillings, extraction of primary teeth, applications of fluorides, placement of fissure sealants and oral health education and promotion. For care beyond the scope of dental therapy practice, children are referred to an appropriate contracting dental practitioner. A Special Dental Benefit Scheme covers the free care provided by contracting dentists following a referral from a dental therapist and emergency treatment provided by dentists outside the hours of school dental clinic. Adolescents are eligible for free basic dental care from school Year 9 until their 18th birthday. This service is provided by private dentists that are contracted by district health boards under Combined Dental Agreement.

http://www.healthysmiles.org.nz/default,128,dentistry-in-new-zealand.sm. [Accessed on: 22/11/2011].

Appendix 2: Criteria for referral for state-funded orthodontic services (Modified IOTN)

Grade 5	Treatment required	
	5.a	Increased overjet > 9 mm
	5.h	Extensive hypodontia (2 or more teeth missing in any quadrant excluding third molars) requiring pre-restorative orthodontics. Amelogenesis imperfecta and other dental anomalies which require pre-prosthetic orthodontic care. Incisors lost due to trauma assessed on a case by case basis
	5.i	Impeded eruption of teeth (apart from 3rd molars and second premolars) due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth, and any pathological cause
	5.m	Reverse overjet > 3.5 mm with reported masticatory and speech difficulties
	5.p	Defects of cleft lip and palate
	5.s	Submerged deciduous teeth – arrange removal of teeth but orthodontic treatment not necessarily provided
Grade 4	**Treatment required**	
	4.b	Reverse overjet > 3.5 mm with no masticatory or speech difficulties
	4.c	Anterior or posterior crossbites with > 2 mm discrepancy between the retruded contact position and intercuspal position
	4.d	Severe displacements of anterior teeth > 4 mm but only with Aesthetic Component of 8 to 10 (see photographs below).
	4.e	Extreme lateral or anterior open bites > 4 mm
	4.f	Increased and complete overbite with gingival or palatal trauma
	4.l	Posterior lingual crossbite with no functional occlusal contact in an entire buccal segment
	4.m	Reverse overjet > 1 mm but < 3.5 mm with recorded masticatory and speech difficulties

Additional eligibility critieria, assessed on a case by case basis:

- Children who are in the care of the Health Service Executive and do not fall under any of the other categories
- Children with special needs who are referred by the primary dental care special needs service or a paediatric dental consultant

4d. Aesthetic component of 8 to 10

Appendix 3: Search strategies

Timing of tooth emergence

Search strategy for Pubmed. Limits: 1980 – 06/04/2011, Humans, English language.

1. Tooth Eruption [Mesh]
2 (tooth OR dental) AND (emergence or erupt*)
3 permanent dentition
4 Dentition/Permanent [Mesh]
5 “permanent tooth” OR “permanent teeth” OR “permanent molar”
6 age OR time OR timing OR chronology OR duration
7 1 OR 2
8 Tooth Eruption, Ectopic [Mesh]
9 7 NOT 8
10 3 OR 4 OR 5
11 9 AND 10
12 6 AND 11

Total Hits: 313 (April 2011)

Longitudinal studies: 9

Caries progression

Search strategy for Pubmed, Limits; 1995–29/04/2011 (No time limit for reviews). Updated 10/01/2012

((((("Dental Caries"[MeSH]) OR (DMF) OR ("DMF Index"[MeSH]) OR ("Dental Caries Susceptibility"[MeSH]) OR ("Tooth Demineralization"[MeSH]) OR ("Tooth Remineralization"[MeSH])) OR (dental caries OR caries OR dental cavit* OR dental decay OR tooth decay OR demineral* OR remineral* OR caries increment)) AND ((child* OR preschool* OR preschool child* OR toddler* OR teenager* OR young adult* OR young person* OR baby OR babies OR infant*) OR (("Child"[MeSH]) OR ("Child, Preschool"[MeSH]) OR ("Infant"[MeSH]) OR ("Adolescent"[MeSH])))) AND (("caries progression") OR ("Disease Progression"[MeSH]))

Total hits: 256 (January 2012) (no time limit)

Longitudinal studies: 28

School Dental Screening

The search terms used were (“dental examination” OR “dental screening” OR “dental inspection”) AND school. The search was limited to studies on humans and to children aged 0-18. Updates of the search were run regularly from the start of guideline development, with the most recent update being 10/01/2012. This yielded a total of 228 publications, of which 44 were obtained in full. Most of the publications came from the UK. Six randomised controlled trials (8 publications) [57,59-62,64,65,100] were identified, four of which involved school-based dental screening.[56,58,59–61]

Text books

Andreasen JO, Kolsen-Petersen JK, Laskin DM, editors. Textbook and color atlas of tooth impactions: Diagnosis, Treatment, Prevention. Copenhagen: Munksgaard, 1997.

Fejerskov O, Kidd E. (Editors) Dental Caries: The disease and its clinical management. 2nd Ed. Oxford: Blackwell:Munksgaard, 2008

Pitts N, (editor). Detection, Assessment, Diagnosis and Monitoring of Caries. London: Karger, 2009.

Raffle A, Gray M. Screening: Evidence and Practice. Oxford: Oxford University Press, 2007.

Appendix 4: Caries Risk Assessment Checklist

Dentist's name: _____ Date: _____First assessment: Y / N

Child's name: _____ School: _____ Date of birth:_____

Risk Factors/Indicators **A "YES" in the shaded section indicates that the child is likely to be at high risk of or from caries**	Please circle the most appropriate answer	
• Age 0–3 with caries (cavitated or non-cavitated)	**Yes**	No
• Age 4–6 with dmft>2 or DMFT>0	**Yes**	No
• Age 7 and over with active smooth surface caries (cavitated or non-cavitated) on one or more permanent teeth	**Yes**	No
• New caries lesions in last 12 months	**Yes**	No
• Hypomineralised permanent molars	**Yes**	No
• Medical or other conditions where dental caries could put the patient's general health at increased risk	**Yes**	No
• Medical or other conditions that could increase the patient's risk of developing dental caries	**Yes**	No
• Medical or other conditions that may reduce the patient's ability to maintain their oral health, or that may complicate dental treatment	**Yes**	No
The following indicators should also be considered when assessing the child's risk of developing caries		
• Age 7–10 with dmft>3 or DMFT>0	**Yes**	No
• Age 11–13 with DMFT>2	**Yes**	No
• Age 14–15 with DMFT>4	**Yes**	No
• Deep pits and fissures in permanent teeth	**Yes**	No
• Full medical card	**Yes**	No
• Sweet snacks or drinks between meals more than twice a day	**Yes**	No
Protective Factors **A "NO" in this section indicates the absence of protective factors which may increase the child's risk of developing caries**		
• Fissure sealants	Yes	**No**
• Brushes twice a day or more	Yes	**No**
• Uses toothpaste containing 1000 ppm F or more	Yes	**No**
• Fluoridated water supply	Yes	**No/Don't know**

Is this child at high risk of or from caries?	**YES**	**NO**

Notes on the Caries Risk Assessment Checklist

Introduction

The approach taken during the development of this checklist was that all children are at risk of developing caries but some children are at high risk, and these are the ones we want to identify. The assessment of caries risk is something that every dentist does, usually informally or implicitly. The aim of the checklist is to encourage a formal, systematic approach to identifying individual children who may be at high risk of developing decay. Caries risk assessment should form the basis of a risk-based approach to patient treatment and recall, with repeat assessments indicating if the child's risk status is changing over time.

The checklist is divided into 2 main sections: risk factors/indicators and protective factors. The shaded part contains the risk factors/indicators that the Guideline Development Group considered most important for identifying high caries risk children. A score in the shaded part indicates that a child is likely to be at high risk of or from caries. Other indicators that should be taken into account when assessing the child's risk status complete this section. The second section contains protective factors that should also be considered. The checklist combines the two most consistent predictors of future caries: previous caries experience[101] and the dentist's own assessment.[102,103] The dentist makes the final decision about caries risk status, based on their overall assessment of the patient. The following notes give some pointers on filling in the checklist.

Risk Factors/Indicators

Age 0–3: Any child under the age of 4 who shows any evidence of caries – with or without cavitation – should be considered high risk, as the consequences of any caries for this age group can mean recourse to general anaesthesia for treatment.

Age 7 and over: Caries is a dynamic process that can progress or arrest. The concept of lesion activity is becoming increasingly important in assessing a patient's risk of developing future caries. There is currently no international consensus on the diagnosis of active lesions, and for the purposes of this checklist, we are suggesting a modified version of the criteria defined by Nyvad et al.[104] An active lesion is one which is likely to progress if nothing is done. It is more than just a 'white spot' lesion. An active, non cavitated enamel lesion is characterised by a whitish/yellow opaque surface with loss of lustre and exhibiting a 'chalky' appearance. Inactive lesions tend to be shiny and smooth.

New lesions: New caries in the last 12 months, or progression of non-cavitated lesions (clinical or radiographic) is a good indicator of high caries activity. It would be a key factor to assess, particularly on repeat caries risk assessments for children deemed to be high risk.

Smooth surface caries: At least 70% of caries in permanent teeth in Irish children occurs on pit and fissure surfaces.[37] The occurrence of caries on smooth surfaces, i.e. proximal, buccal or palatal (excluding the respective pits) or lingual surfaces, indicates a different pattern of disease and potentially a greater risk of developing further decay. The presence of approximal lesions on bitewing (if available) should also be considered when assessing smooth surface lesions (although it will not be possible to assess the activity of the lesion from radiographs taken at a single time point).

Hypomineralised molars: Molar hypomineralisation varies in severity, and some hypomineralised molars can disintegrate rapidly, making early detection and monitoring of these teeth essential. In more severe cases, hypomineralised molars present a restorative and long-term management challenge. Other developmental disorders of tooth formation, e.g. amelogenesis imperfecta, which can predispose to caries, should also be considered in this category.

Deep pits and fissures: The morphology of the occlusal surface has been shown to be a good predictor of caries risk.[103,105]

Medical or other conditions: This section considers factors from the medical history that you normally take for your patient that may put the person at risk of or from caries. Some examples of conditions that could be included in each of the categories are shown below.

Medical or other conditions	Examples
Conditions where dental caries could put the patient's general health at increased risk	Cardiovascular disease Bleeding disorders Immunosuppression
Conditions that could increase the patient's risk of developing dental caries	Salivary hypofunction Medications that reduce saliva flow Long term use of sugar-containing medicine
Conditions that may reduce the patient's ability to maintain their oral health, or that may complicate dental treatment	Certain physical and intellectual disabilities, Cleft lip/palate Anxious*, nervous* or phobic conditions, Behavioural problems

**Over and above what would be considered 'normal' anxiety or nervousness for children*

DMFT (Decayed/Missing/Filled Teeth): In calculating dmft/DMFT, only teeth that have been extracted due to caries should be counted as missing. Similarly, only fillings that have been placed due to caries should be counted. The DMFT cut-offs in the checklist are based on the mean DMFT of the top one third of children with the highest caries levels from the North South survey.[37] In the North South survey, caries was recorded without the use of (bitewing) radiographs; therefore caries detected on (bitewing) radiographs should not be included in the dmft/DMFT calculation.

Dietary habits: Diet is one of the main risk factors for dental caries, and it can be the most difficult and sensitive area on which to get accurate information. We are suggesting that the question could be phrased along the lines of the question on diet that was included in the North South survey.

Dietary habits	Suggested question
Sweet snacks or drinks between meals more than twice a day	How often does your child eat sweet food or drinks, e.g. biscuits, cakes, sweets, fizzy drinks/squash, fruit drinks etc., between normal meals?

Medical Card: There is fairly strong evidence of an inverse relationship between socio-economic status and oral health in children under 12 years of age.[106] Medical card status has been used in Irish studies as an indicator of disadvantage. Medical card status may be a particularly useful indicator of caries risk where children are too young for their risk to be based on caries history. Since the introduction of the GP Visit card, which has higher income thresholds for eligibility, it is necessary to establish if the patient has a Full Medical card. Very often this data is collected as part of the medical history or patient details, and data from these sources can be used to complete the checklist.

Protective Factors

The effectiveness of the protective factors listed in the checklist at reducing caries has been established in various systematic reviews.[107-111] The absence of protective factors could increase a child's risk of developing caries.

Appendix 5: Data protection and sharing of class lists

Obtained from the Office of the Data Protection Commissioner

We advise schools that when they are approached for information by third parties, including state bodies, that they satisfy themselves that they have a basis under the Data Protection Acts to comply with the request.

Often, this will require getting the consent of parents either on a once-off basis for a particular use of data or consent collected as part of the enrolment process. Aside from consent, where a school is either under a legal obligation to provide specific data or where legislation permits a school to release specific data, it can do so in compliance with the Acts and we advise schools that it seek the specific legal basis in writing from the requesting entity before it considers disclosing data.

There is a legal basis under the relevant Health Acts which require school managers to "provide reasonable facilities" for the purposes of undertaking medical inspections of children at schools, such as the dental scheme.

There are provisions in the Health Act 1947 (Section 26) as well as the provisions of Sections 66 & 67 of the Health Act 1970 which permits the provision of facilities by schools for specified inspections. The HSE would not, as far as this Office is aware, have a general entitlement to make general requests for contact details outside of these specific areas.

As aforementioned, we would expect that when the HSE is making such requests to schools that it cites the legal basis it is relying on in order to allow schools to ensure that they are complying with their data protection responsibilities. From a transparency perspective, we would still expect schools to inform parents at enrolment stage that their contact details may be made available for these purposes.

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

<Local Dental Clinic>
< Address>
<Telephone>

<HSE Dentist>

Appendix 6

CONSENT FORM FOR THE HSE SCHOOL ORAL HEALTH PROGRAMME

The HSE School Oral Health Programme aims to improve children's oral health by providing oral health assessments and any necessary preventive and treatment services. The Programme is delivered by a team of dentists, hygienists and dental nurses who are skilled at dealing with children of all ages. **There is no charge for this service.**
Please complete and sign this form to indicate whether or not you wish to have your child assessed by the dentist. **No treatment is provided in the school.** Please return the form to your child's teacher as soon as possible. We will send you an appointment for your child to attend the local dental clinic for an oral health assessment.

PLEASE USE BLOCK CAPITALS

School name _____ **Class** Jr Inf | Sr Inf | 1st | 2nd | 3rd | 4th | 5th | 6th

Child's Details

Family name _____

First name _____ Second name _____

Date of Birth d d m m y y y y Gender Male ☐ Female ☐

Child's PPSN _____

Mother's birth surname _____

Mother's birth surname (maiden name) assists us in verifying your child's correct personal public service number (PPSN)

Home address

House name/No. _____

Street _____

Town/Townland _____

County _____

Daytime telephone _____ Mobile _____

Health information

Has your child attend a HSE dental clinic before? Yes ☐ No ☐

If 'Yes', please state the name of the clinic: _____

Name and address of child's GP: _____

_____

Name and address of child's dentist *(if any):* _____

_____

Does your child have latex (rubber) allergy? Yes ☐ No ☐

If your child has a medical or other condition that you would like to discuss with the HSE dentist before your child comes to the dental clinic, please contact the local dental clinic at the telephone number on the top of this page.

YES, I *CONSENT* to my child _____having an oral health assessment.

Signed:..... **Date:**.....
Parent / Legal Guardian

NO, I *DO NOT CONSENT* to my child _____having an oral health assessment.

Signed:..... **Date:**.....
Parent / Legal Guardian

The information on this form will be retained by us for the purposes of service provision, planning, and audit.
Any personal information you provide will be handled in accordance with the Data Protection Acts 1998 and 2003 and will only be used for the purpose identified on the form.

Appendix 7: Summary of European recommendations on selection criteria for taking bitewing radiographs

This table summarises the selection criteria for using radiographs for the detection of caries in children and adolescents from two European guidelines on dental radiography. Both guidelines emphasise the need for a thorough clinical examination and assessment of the patient's caries risk status before considering the use of radiographs. It is important to note that the criteria for assessment and the categories of caries risk differ between the guidelines, and are not directly comparable to the criteria outlined in the Caries Risk Assessment Checklist recommended in this guideline. These recommendations must be considered in conjunction with recommendations on improving radiation protection and quality assurance (S.I. 478/2002). Caries risk status should be reassessed periodically as it can change over time, and the decision to repeat radiographs should be based on the clinician's re-assessment of the patient's caries risk.

Guideline	Principles of radiographic examination	Recommended interval to next bitewing examination	
		High Risk/ Moderate Risk	Low Risk
European Commission 2004: [93] Radiation Protection. European guidelines on radiation protection in dental radiology. The safe use of radiographs in dental practice	• No radiographs should be selected unless a history and clinical examination have been performed. • 'Routine' radiography is unacceptable practice. • In children, the prescription of bitewing radiographs for caries diagnosis should be based upon caries risk assessment. • Intervals between subsequent radiographic examinations must be reassessed for each new period, as individuals can move in and out of risk categories over time. • In high caries risk children there is good evidence to support taking posterior bitewing radiographs at the initial examination, even in the absence of clinically detectable decay. • In moderate caries risk children the evidence also supports the diagnostic use of bitewing radiographs. • In low caries risk children there is less good evidence to support the taking of posterior bitewing radiographs. Nevertheless, radiographs reveal 2–3 times more caries lesions than clinical examination alone.	• 6 months * (high risk) or 1 year (moderate risk) until no new or active lesions are apparent and the individual has entered a lower risk category. *Bitewings should not be taken more frequently than this and it is imperative to reassess caries risk in order to justify using this interval again.	• 12–18 months (deciduous dentition) • 24 months (permanent dentition) may be used*, although longer intervals may be appropriate where there is continuing low caries risk. **applies to children classified as low caries risk where the caries population prevalence is <u>not</u> low.* • Radiography for caries diagnosis in low caries risk children should take into account population prevalence of caries.
Espelid et al. 2003: [92] EAPD guidelines for use of radiographs in children.	• If a radiograph is not expected to change diagnosis or treatment or add other useful information, it should not be taken. • Timing of first radiograph should be based on epidemiological data on the prevalence and rate of progression of approximal caries lesions and risk factors for caries. • Intervals between bitewing examinations should be determined by individual caries risk assessment. • Age groups considered particularly likely to benefit from bitewing radiographs for the detection of early approximal caries are 5 year olds, 8–9 year olds and 12–14 year olds. • No radiograph should be taken for routine purposes only. Children with negligible caries risk should be excluded from bitewing radiographs as the diagnostic yield for these children may be minimal. • High risk is defined as enamel/dentine lesions in approximal surfaces. • Low risk is defined as caries free on approximal surfaces or an occasional lesion without other indications of high risk.	• Bitewing radiographs at 1 year intervals (High risk).	• Bitewing radiographs at 2–3 year intervals.

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