In line with trends in many developed countries, the prevalence and severity of dental caries among children in the Republic of Ireland has declined dramatically since the 1960s. Much of this decline has been attributed to the availability of fluoride, through water fluoridation and also through the home use of fluoride toothpastes. However, in spite of the overall improvement in dental health, caries remains a very common disease among Irish children, affecting between 37% and 55% of five-year-olds in fluoridated and non-fluoridated areas, respectively, approximately one-fifth of eight-year-olds, half of all 12-year-olds and three-quarters of all 15-year-olds.

While water fluoridation has been the cornerstone of caries prevention for decades in the Republic of Ireland, it is important to highlight that Government reports, national health and health promotion strategies and, more recently, the evidence-based guideline ‘Strategies to prevent dental caries in children and adolescents’ clearly recommend that water fluoridation should be supplemented by oral health promotion initiatives, targeted caries-preventive interventions involving the use of topical fluorides, and improved access to dental services. That these other measures have not been implemented in any structured manner nationally perhaps reflects an unrealistic expectation on the part of decision-makers and budget holders that water fluoridation alone is sufficient to solve all our oral health problems, in spite of evidence to the contrary.

The ‘Strategies’ guideline was developed in accordance with international best practice for guideline development and is the core of a suite of evidence-based guidelines for the prevention of
It sets out a new framework for caries prevention that operates at population level, targeted population level, and at the level of the individual, in recognition of the fact that a combination of preventive approaches is required to reduce disease levels.

The focus of the guideline is on early identification of high caries risk children from infancy onwards, so that effective preventive measures can be initiated in a timely manner. This approach involves integrating oral health assessment and oral health promotion into child developmental visits and into the wider primary care setting, and developing referral pathways into dental services from primary, secondary and social care services, to ensure that children who are at greatest risk have improved access to oral health services.

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
- Age 11-13 with DMFT>2
- Age 14-15 with DMFT>4
- Deep pits and fissures in permanent teeth
- Full medical card
- Sweet snacks or drinks between meals more than twice a day

Protective factors

A "NO" in this section indicates the absence of protective factors that may increase the child's risk of developing caries:

- Fissure sealants
- Brushes twice a day or more
- Uses toothpaste containing 1,000ppm F or more
- Fluoridated water supply

Is this child at high risk of or from caries?

**TABLE 1: Caries Risk Assessment Checklist.**

<table>
<thead>
<tr>
<th>Risk factors/indicators</th>
<th>Please circle the most appropriate answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A “YES” in the shaded section indicates that the child is likely to be at high risk of or from caries</strong></td>
<td></td>
</tr>
<tr>
<td>Age 0-3 with caries (cavitated or non-cavitated)</td>
<td>Yes</td>
</tr>
<tr>
<td>Age 4-6 with dmft&gt;2 or DMFT&gt;0</td>
<td>Yes</td>
</tr>
<tr>
<td>Age 7 and over with active smooth surface caries (cavitated or non-cavitated) on one or more permanent teeth</td>
<td>Yes</td>
</tr>
<tr>
<td>New caries lesions in last 12 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Hypomineralised permanent molars</td>
<td>Yes</td>
</tr>
<tr>
<td>Medical or other conditions where dental caries could put the patient’s general health at increased risk</td>
<td>Yes</td>
</tr>
<tr>
<td>Medical or other conditions that could increase the patient’s risk of developing dental caries</td>
<td>Yes</td>
</tr>
<tr>
<td>Medical or other conditions that may reduce the patient’s ability to maintain their oral health, or that may complicate dental treatment</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| 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 |

<table>
<thead>
<tr>
<th>Protective factors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A &quot;NO&quot; in this section indicates the absence of protective factors that may increase the child’s risk of developing caries</td>
<td></td>
</tr>
<tr>
<td>Fissure sealants</td>
<td>Yes</td>
</tr>
<tr>
<td>Brushes twice a day or more</td>
<td>Yes</td>
</tr>
<tr>
<td>Uses toothpaste containing 1,000ppm F or more</td>
<td>Yes</td>
</tr>
<tr>
<td>Fluoridated water supply</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Is this child at high risk of or from caries?

---

**Social inequalities in oral health**

Although water fluoridation has been shown to reduce caries levels across the social divide in Ireland, children who are disadvantaged still bear a greater burden of disease than children who are not disadvantaged. The North South Survey of Children's Dental Health showed that the impact of disadvantage on caries levels was greatest in the younger age groups (aged five and eight), where, with the exception of five-year-old children in non-fluoridated areas, the percentage difference in caries scores between disadvantaged and non-disadvantaged groups was just over 40%. Findings such as these highlight the need to reconsider how caries prevention should be approached in this country, since substantial inequality in oral health exists within fluoridated and non-fluoridated areas, and not just between them.
Oral health inequalities are socially determined, i.e., those who are at the top of the social hierarchy tend to have better oral health than those at the bottom.\textsuperscript{15} To reduce the steepness of the social gradient in oral health, actions must be universal, but with a scale and intensity that is proportionate to the level of disadvantage.\textsuperscript{16} This is called proportionate universalism, and is represented in the ‘Strategies’ guideline by its population, targeted population and individual approach. The recommendations for targeted population strategies include the community-based use of topical fluorides such as fluoride toothpaste, varnish and mouthrinse in high caries risk groups or populations. Arising from these recommendations, a supervised pre-school toothbrushing programme has recently commenced on the north side of Cork city. The toothbrushing programme is part of the Health Research Board-funded pilot project ‘Happy Teeth’, which aims to improve the oral health of pre-school children in disadvantaged areas.

Caries risk assessment

While preventive strategies reduce disease levels in the population, adequate treatment services must also be available to deal with cases of existing disease. The provision of dental services to children based on the age of emergence of the permanent molar teeth has been enshrined in public dental service policy and practice since the 1980s.\textsuperscript{4} Even with water fluoridation in the background, this level of access to care is inadequate to cater for the oral health needs of school-aged children and adolescents, and ignores the oral health needs of preschool children. It also reflects a tooth-centred, medical model approach to oral health rather than a child-centred, empowering approach.

As part of its framework for identifying high caries risk children, the ‘Strategies’ guideline recommends that all children should be offered a dental assessment, including a formal caries risk assessment, during their first year in primary school. The rationale for caries risk assessment is that the treatment and preventive measures received by the patient will be tailored to their individual needs, thus directing appropriate caries management and preventive care towards those at ‘high’ risk, and avoiding unnecessary treatments for those at ‘low’ risk.

An example of the latter would be the ‘blanket’ application of fissure sealant in a low caries population to all children in a specific age group or class, without consideration of the caries risk status of the individual. With formal caries risk assessment, the factors that contribute to a child having caries are identified, and modifiable risk factors can be addressed. Recording caries risk status also allows changes over time to be monitored, and treatment and recall to be adjusted accordingly, with more intensive intervention provided for those with greatest needs. Ultimately, the clinician hopes to see the patient’s caries risk status improve over time. Caries risk assessment recognises that, just as the caries process itself is dynamic, so too is an individual’s caries risk status. This means that caries risk assessment is an ongoing process, and consequently, regular oral health assessment during childhood and adolescence is required.

The Caries Risk Assessment Checklist (CRAC) has been developed for the Irish population based on a review of the literature on risk factors for caries, consideration of existing oral health risk assessment tools, knowledge of the caries profile of children and adolescents in Ireland, and the clinical experience of the ‘Strategies’ Guideline Development Group. High caries risk status is assigned based on the dentist’s assessment of the balance between risk factors and protective factors for a particular patient. The CRAC is shown in Table 1. Further information on the development and application of the CRAC can be found in the full ‘Strategies’ guideline at http://ohsrc.ucc.ie/html/ guidelines.html.

Caries prevention

The caries preventive strategies recommended for high caries risk children, based on the ‘Strategies’ and other guidelines in the suite, include:

- Twice daily brushing with a small pea-sized amount\textsuperscript{*} of toothpaste containing at least 1,000ppm F, at bedtime and at one other time during the day. Spit out toothpaste and do not rinse after brushing.

  This recommendation applies to children under the age of two years who have been assessed as high caries risk, and to all children over the age of two years.

  \* Over the age of seven years, the risk of ingesting toothpaste is greatly reduced and a pea-sized amount of toothpaste or more can be used.

- Children under the age of seven should be supervised by an adult when brushing their teeth.

- Application of resin-based fluoride varnish containing 22,600ppm F at intervals of six months or three months, depending on assessment of caries risk.

- Application and maintenance of fissure sealants to vulnerable pits and fissures of permanent teeth, with priority given to sealing first and second permanent molars.

- Oral health education to encourage healthy eating in line with national guidelines.
Use of sugar-free medicines when available.
Recall interval based on clinician’s assessment of caries risk and not exceeding 12 months.

Monitoring and evaluation
In the UK, monitoring of children’s oral health is undertaken regularly. This allows trends in oral health to be measured, and also allows evaluation of the impact of large-scale oral health interventions. Data from the UK show that caries levels in children have continued to decline in England and Scotland in the last 10 years. Both countries have actively promoted preventive care through the implementation of evidence-based guidelines and in the case of Scotland, through Childsmile, a nationwide, multi-faceted and multi-sectoral oral health promotion programme to improve the oral health of young children. While our nearest neighbours make advances in improving children’s oral health, the impact of social, economic and political changes in this country in the last five years could potentially undermine the improvements in oral health achieved in recent decades for both children and adults.

The environment in which existing oral health policy such as water fluoridation operates has changed radically. In 2002, the Forum on Fluoridation recommended reducing fluoride levels in water from 0.8-1ppm F to 0.6-0.8ppm F with a target of 0.7. This change was made in response to the evidence of increasing levels of fluorosis in both fluoridated and non-fluoridated areas, and declining caries levels, and was supported by international evidence, which suggested that the revised level of 0.7ppm F was a trade-off between caries and fluorosis. The reduction in water fluoride levels came into effect in 2007 (SI No 42/2007 Fluoridation of water supplies). In a further step to minimise the risk of fluorosis, the Forum recommended that toothpaste should not be used for children until the age of two years, and that professional advice on the use of fluoride toothpaste should be sought if a child under the age of two years was considered at high risk of developing caries. These recommendations were made at a time when Public Dental Service staff numbers were at a peak, but prior to the development of the suite of evidence-based guidelines, which reinforced the need for early intervention and additional caries prevention strategies to improve children’s oral health. They were also made in the context of reasonable access to dental services for adult medical card holders and insured workers. Since these recommendations came into effect, access to dental services for both adults and children has been severely curtailed, and the opportunity to implement the guidelines is still awaited. We also know more about the dietary habits of people in Ireland, and that foods high in fat and sugars are consumed at twice the recommended level, putting both oral health and general health at risk. Given that water fluoridation is the cornerstone of caries control and prevention in this country, it is critical to determine if the reduced level of fluoride that now pertains is sufficient to control caries in the current climate. The impact of the recommendation not to use toothpaste under the age of two also needs to be evaluated. In light of the evidence-based guidelines developed in Ireland, new policy must focus on reducing oral health inequalities. This can only be done by looking beyond the four walls of the dental surgery and taking an integrated, common risk factor approach to improving and maintaining the oral health of the Irish population.

Acknowledgements
My thanks to Professor Denis O’Mullane and Drs Mairead Harding, Patrice James and Mary O’Farrell for their helpful comments on drafts of this paper.

References


Dr Carmel Parnell, Oral Health Services Research Centre and HSE Meath Oral Health Services Research Centre, University Dental School, Wilton, Cork
T: 021-490 1210/4
F: 021-454 5391
E: c.parnell@ucc.ie