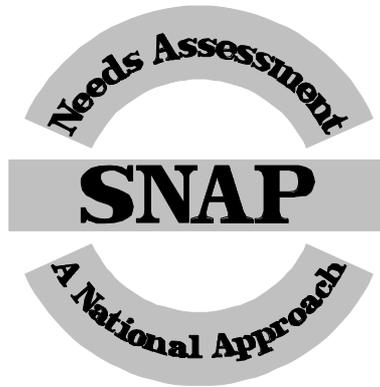


# Scottish Needs Assessment Programme



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## Dental Caries in Children

(UPDATE)

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# **Scottish Needs Assessment Programme**

## **Oral Health Network**

### **Dental Caries in Children**

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## **INTRODUCTORY NOTE**

This report was drafted in summer 1998. Readers should be aware that dental services in Scotland and the United Kingdom, like other parts of the National Health Service, are undergoing a period of change and that recent Government White and Green Papers are being implemented and consulted upon at present. Thus the precise way in which the Oral Health Strategy for Scotland will be developed is not yet clear. While we are confident in the appropriateness of our recommendations, it will be necessary to review this report again at some time in the future.

## **Acknowledgements**

We would like to acknowledge the constructive contributions of other members of the SNAP Oral Health Network and all those who have helped in the production and proofing of this report. In particular we are indebted to Dr Hazel Fyffe for her assistance with updating the text and references and to the staff of the Dental Health Services Research Unit for the production of illustrations and draft reports.

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The Involvement of Service Users in Assessing the Need for, Commissioning  
and Monitoring Mental Health Services  
Orthodontic Care  
Coronary Heart Disease  
Breast Cancer in Women in Scotland

# CONTENTS

## Executive Summary and (October 1998) Recommendations

<b>1</b>	<b>Introduction</b>	<b>1</b>
	1.1 Statement of the problem	
	1.2 Attitudes and behaviour	
<b>2</b>	<b>Diagnosis of caries in children</b>	<b>4</b>
	2.1 Measurement methods in clinical practice	
	2.2 Measurement methods in research	
	2.3 Measurement methods in epidemiology	
	2.4 Measurement methods in screening/oral monitoring	
<b>3</b>	<b>Epidemiology of caries in children</b>	<b>7</b>
	3.1 Prevalence of disease in key age groups	
	3.2 Trends in caries experience	
	3.3 Trends in the provision of care	
	3.4 Targets for 5-year-olds	
	3.5 Targets for 12-year-olds	
	3.6 Information for Health Services Research	
	3.6 New information available and awaited imminently	
<b>4</b>	<b>Organisation of Dental Services for children</b>	<b>12</b>
	4.1 General Dental Service	
	4.2 Community Dental Service	
	4.3 Hospital Dental Service	
<b>5</b>	<b>Prevention of caries in children</b>	<b>15</b>
	5.1 Population measures/Public Health Programmes	
	5.2 Small Group Preventive Measures	
	5.3 Individual Programmes	
<b>6</b>	<b>Treatment of caries in children</b>	<b>22</b>
	6.1 Changing concepts of ideal treatment	
	6.2 Dental General Anaesthetics in Scotland	
<b>7</b>	<b>Costs and related issues</b>	<b>24</b>
<b>8</b>	<b>Strategies for the Future</b>	<b>25</b>
	<b>References</b>	<b>26</b>

## **EXECUTIVE SUMMARY AND (October 1998) RECOMMENDATIONS**

- 1.1 Statement of the problem** - Dental caries (tooth decay) is a preventable multi-factorial disease, associated with significant costs, morbidity, and some mortality. Dental fear, arising from initial experiences in childhood, is still a significant problem in contributing to negative dental attitudes which persist into adult life, while dental indifference is responsible for failures to access services or respond to preventive advice. There is much to be done if the targets set in The Oral Health Strategy for Scotland for 5- and 12-year-olds are to be met and if appropriate local targets are to be specified and achieved.
- 1.2 Attitudes and behaviour** - Determining the views of service consumers and non-consumers is an important but very difficult task, especially in the case of young children. Equally, understanding and influencing parents' and children's attitudes and behaviours is important if progress is to be made in caries prevention and management. Continuing and appropriate action is required from the Health Education Board for Scotland, in liaising with all other parties involved in Dental and Oral Health Promotion in Scotland, in order to provide effective and integrated health promotion to benefit children. A particular focus must be on children who are at higher risk to caries and more deprived than their peers, as this group has the majority of the disease.
- 2 Diagnosis of caries in children** - There is a major problem of different interpretations and usage of some key dental terms across different parts of dentistry which is a trap for the unwary. The disease of caries is measured in a number of different, but superficially similar, ways which can readily give rise to confusion and the inappropriate use of epidemiological and service data.
- 3 Epidemiology of caries in children**

  - 3.1 Caries prevalence in key age groups** - Since 1987, dental caries prevalence throughout Scotland has been monitored by the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP), a joint venture between all 15 Health Boards (through the CADOs/CDPH Group) and Chief Scientist Office's Dental Health Services Research Unit in Dundee. These surveys regularly demonstrate that, together with children in Northern Ireland, Scottish children have more caries than their peers elsewhere in the United Kingdom. The results of surveys of 5-year-olds provide the most sensitive barometer of change. It should be noted that the distribution of disease is now markedly skewed and that most of the disease experience (76%) is in a minority of the children (26%).
  - 3.2 Trends in caries experience** - It is evident that although caries experience was declining satisfactorily for 5- and 12-year-olds between 1983 and 1987/88, the rate of decline has slowed markedly in 12-year-olds and has ceased for 5-year-olds. Data from other high caries areas in the UK also demonstrate the same trends.
  - 3.3 Trends in the provision of care** - Trends in the make-up of the component parts of the Decayed Missing and Filled Index (known as DMF for permanent teeth, dmf for primary teeth) suggest that the

provision of fillings has declined markedly, whilst untreated dentinal decay has risen.

- 3.4 Targets for 5-year-olds** - The national target relating to these children is that by the year 2000 "60% of 5 year old school entrants should have neither cavities nor have had fillings or extractions". Meeting this target by the year 2000 is judged to be impossible, as values have "plateaued" between 38 - 42% since the late 1980s. Further preventive initiatives are required if this national target is ever to be met.
- 3.5 Targets for 12-year-olds** - The national target relating to these children is that by the year 2005 they "should have on average no more than 1.5 teeth decayed, missing or filled (D<sub>3</sub>MFT)." In 1993 the D<sub>3</sub>MFT was 2.18 which, by 1996/97, had fallen to 1.75.
- 3.6 Information for Health Services Research** - The Scottish Dental Practice Board (SDPB) and Dental Practice Division (DPD) have a wealth of data relating to dental services in Scotland. Elements of these datasets should be of considerable value to Health Boards and health services researchers, now that improvements in Information Technology methodologies of collecting data from GDPs have been introduced. Revised NHS information policies offer potential for using this information to secure improvements in oral health.
- 3.7 New information available and awaited imminently** - Since the publication of the original "Dental Caries in Children" SNAP Report in 1994 a number of awaited publications have appeared including the *Oral Health Strategy for Scotland*. The recent White Paper and Green Paper, combined with the Personal Dental Services pilots, will have a direct bearing on future NHS dental frameworks. Results from a number of research projects should also inform service development.
- 4 Organisation of Dental Services for children** - The bulk (70-80%) of routine dental care for children who attend a dentist is provided by independent practitioners in the General Dental Service (GDS) working to a nationally agreed contract. Unfortunately, however, not all children attend sufficiently regularly and in 1996/97 only 56% of 3-5 year olds and 67% of 6-12 year olds were registered with the GDS. The arrangements for children were modified in September 1996 and it is too soon to establish the effects of these changes which aimed to promote appropriate preventive and operative dental care. The Community Dental Service aims to provide complementary care for special needs groups and those who cannot or will not seek care within the GDS. Recent legislation has provided for pilot studies of a new Personal Dental Service (PDS). The Hospital Dental Service provides secondary care; while the traditional dental specialties are provided at a number of sites including Edinburgh Dental Institute, some sub-specialties are only found at present in the two undergraduate schools in Dundee and Glasgow.
- 5 Prevention of caries in children** - This is a priority set out in the Oral Health Strategy for Scotland. Prevention, delivered using a multi-agency approach, is seen as the key to achieving health gain. This will involve not only the dental team, but others in the primary care medical team, such as health visitors. A wide variety of measures exist such as Population Measures, Small Group

Preventive Measures and Individual Programmes. Water fluoridation is the preferred and most effective route and has the advantage of reaching particularly the deprived minority with most of the disease. Where this is not deliverable, the targeted use of fluoride toothpaste to those who do not yet have access to it, combined with further individualised preventive care involving fluoride and fissure sealants under the supervision of a dentist is seen as the way forward, while existing or reduced quantities of salt (with added potassium fluoride rather than sodium fluoride) should be assessed as a vehicle for fluoride in Scotland.

**6 Treatment of caries in children** - There have been radical changes in the concepts of 'ideal' treatment in dentistry. The extractive phase gave way to the restorative phase which has, in turn, been replaced by the preventive phase. Many dentists and health professionals need to be made aware of this change. Too many teeth are still being extracted and comprehensive prevention is not being delivered in many settings. The SHBDEP surveys indicate an increase in untreated disease in Scottish children.

**7&8 Costs and related issues/Strategies for the Future** - Further work in these areas is indicated. Economic analyses of care under the revised GDS contract are needed to inform any comparisons with pilots of alternative arrangements. Effective local strategies should underpin the delivery of the Oral Health Strategy for Scotland.

## **9 Recommendations**

Having recognised the above on-going developments, the following recommendations are made:

### **9.1 Service Developments -**

9.1.1 The three Dental Services should develop towards providing more integrated and effective ways of delivering appropriate dental care to prevent and manage dental caries in all children residing within Scotland. It must be recognised that there are wide diversities in dental caries status both between and within Health Board areas.

9.1.2 It must be appreciated by those outside the dental services that although the bulk of any restorative care for children which is provided is delivered by the General Dental Services (GDS), the Community Dental Services (CDS) currently provides individual care to priority groups and plays an important "safety net" role for many of those children who cannot/will not access the GDS; in addition, the CDS provides a wide range of preventive programmes: the Hospital Dental Service (HDS) provides a wide range of secondary and some primary care for children within the Dental Hospital catchment areas.

**9.2 Research in Dental Primary Care** - As the minority with most of the disease may not presently be securing continuing treatment from any dental service, it is essential that Research and Development (R&D) led work should be pursued in order to achieve national targets for 5- and 12-year-olds. The Oral Health Strategy for Scotland makes clear the

importance of national and local R&D and suggests linking this work with the aims of the strategy.

There are a number of pertinent R&D projects currently underway across the Scottish Health Boards and Universities. These should be evaluated carefully to see what generalisable benefits can be discerned from them. The UK R&D Programme in Dental Primary Care may also provide new information in time.

R&D led changes should aim to:

- 9.2.1 improve current performance in delivering caries prevention and appropriate restorative care.
- 9.2.2 evaluate the impact of the “ACT Pack” and explore preventive dental training of the primary health care team and the effectiveness of dental health educators within practices
- 9.2.3 explore the effect on dental and oral health of payment methods to GPs
- 9.2.4 find ways of reducing the present inequalities in the dental health of children
- 9.2.5 ensure that the full range of appropriate dental services are available for all children
- 9.2.6 increase registration of pre-school children with dental practitioners

**9.3 Progress in caries prevention** - This should be achieved employing both 'population' and 'high risk' strategies.

9.3.1 Water fluoridation remains the method of choice to underpin caries prevention on a population basis when assessed by either effectiveness or cost. As national polls have shown consistently that a majority of the public support water fluoridation, Health Boards should work with appropriate agencies to seek early implementation.

9.3.2 In addition, alternative preventive strategies must be pursued which should recognise the skewed distribution of disease in the population.

9.3.3 The recommendations for fluoride supplementation set out by the Consultants in Dental Public Health in Scotland should be used.

9.3.4 In the clinical setting, adoption of the SIGN guideline on targeted prevention for 6-16 year old children presenting for care should be considered widely.

**9.4 Appropriate health promotion programmes** - These should be designed to reach those in most need (in terms of caries risk status) and should be purchased, delivered and evaluated in all Health Boards exploiting a multi-agency, multi-sectorial and multi-disciplinary approach.

9.4.1 Both established and new services should be evaluated.

- 9.4.2 Current work from HEBS and that flowing from the Scottish Diet Action Group should be exploited and built on locally with steps taken to ensure that all parties are adequately informed about each others' activities.
- 9.4.3 Plans to ensure a continuity of health promotion activity (specifically addressing topics related to dental caries and diet in children for example) should be secured in all Boards.
- 9.4.4 The contribution of national bodies such as the Health Education Board for Scotland (HEBS) and the Scottish Council for Postgraduate Medical and Dental Education (SCPMDE) in working with Health Boards in an integrated preventive strategy should be maximised.
- 9.4.5 The forthcoming SNAP Report on Oral Health Promotion should be used to help commissioners and providers identify, deploy and evaluate appropriate oral health promotion strategies efficiently and effectively.
- 9.5 Epidemiological Data** - The programme of core annual epidemiological surveys (SHBDEP) allows monitoring of progress towards Oral Health Strategy targets and facilitates comparisons with the rest of the UK and other countries. It should continue in all Health Boards.
- 9.6 Local planning, consultation and action** - All Health Boards should have identified local information on dental health and associated behaviours which informs and shapes their local oral health strategy. These local oral health strategies should be incorporated into Health Improvements Programmes (HIPs) and where appropriate include the action points highlighted in this document. Local dental health strategies and action plans should be discussed fully with professionals, not only in dentistry but throughout the health service and local authorities to ensure that the action plan has a broad base of support and ownership by the local community.
- 9.7 The attitudes to dental care** of population groups in all areas of Scotland should be monitored, particularly with regard to changes in dental services for children, dental fear and dental indifference. This process needs further research and development which should be carried forward in a consistent way, so that meaningful comparisons can be made.
- 9.8 Revised Capitation System** - The impact in Scotland of the September 1996 modifications to the system for remunerating dentists for the dental care of children in the General Dental Service needs to be monitored. Similarly, the effect of the forthcoming SIGN guidelines on targeted caries prevention in children aged 6-16 years presenting for dental care will need to be assessed.
- 9.9 Further areas for investigation** - A number of further areas for investigation relevant to reducing levels of caries in children are suggested:
- 9.9.1 continuing assessment of the feasibility of increasing the provision of appropriate care to high caries individuals in the 0-5 age group.

- 9.9.2 investigations to identify better high caries risk groups and individuals in NHS settings and to explore linking health targets to measures of deprivation such as DEPCAT.
- 9.9.3 evaluations of pilots to explore alternative contractual arrangements in dental primary care should explicitly include estimations of health gain for high caries risk children.
- 9.9.4 monitoring of the implementation of recommendations from the Nuffield report on the training and use of auxiliary personnel in dentistry, in order to see what opportunities arise to develop and test cost-effective methods of reaching those children with an unmet treatment need.

# 1 INTRODUCTION

## 1.1 Statement of the problem

Dental caries (tooth decay) is a preventable multi-factorial disease, associated with significant costs, morbidity, and some mortality. Caries levels in Scottish children are higher than in their peers in other parts of Great Britain and trends showing improvements in children's dental health have slowed in the older age groups and ceased in the case of 5-year-olds. Dental fear, arising from initial experiences in childhood, is still a significant problem in contributing to negative dental attitudes which persist into adult life, while dental indifference is responsible for failures to access services or respond to preventive advice. There is much to be done if the existing national target for 5-year-olds is ever to be met and if appropriate local targets are to be specified and achieved. The target specified that by the year 2000 '60% of 5-year-old school entrants should have neither cavities nor have had fillings or extractions' (HEBS 1991). The Oral Health Strategy for Scotland (SODoH, 1995) identified a new target for older children for the year 2005 which specified that 'children aged 12 should have no more than 1.5 teeth decayed, missing or filled' (D<sub>3</sub>MFT). In 1993 the D<sub>3</sub>MFT of 12-year-olds in Scotland was 2.2 (Pitts et al 1993) with four Health Boards having reached the target. In 1997 seven Health Boards had reached the target but a mean D<sub>3</sub>MFT of 1.75 for Scotland's 12-year-olds (Pitts et al 1997) indicates that improvements are still required.

## 1.2 Attitudes and behaviour

Determining the views of service consumers and non-consumers is an important element in ensuring that services are appropriate and in securing improvements in oral health. It should, however, be appreciated that the acquisition of *valid* insights into consumers' views is a very difficult task, especially in the case of young children where parental attitudes dominate. It is important to establish what events trigger lasting dental fears and phobias later in life and what factors are involved in overcoming dental indifference sufficiently to achieve regular attendance and compliance with preventive advice. At present the 'I couldn't be bothered' response from children and parents remains a major barrier to improving the caries status of Scottish children.

Understanding and influencing parents' and children's attitudes and behaviours is important if progress is to be made in caries prevention and management. Dental caries can be said to be a behavioural disease and is closely related to lifestyle although environmental factors, especially deprivation, play an important role. Many parents are aware that sugary foods are bad for their children's teeth, but feel that the 'costs' of restricting sugary foods are simply too high a price to pay for the uncertain aim that their children will have nice teeth some time in the future.

The period of primary socialisation within the family is important for determining whether a child will enter school with a healthy dentition. It is known that a mother's attendance pattern at the dentist closely influences

that of her children (Crawford and Lennon, 1992). For those parents of pre-school children who do not attend early, other health professionals such as health visitors are an important means of influencing those at risk. In a middle class family, socialisation will include the adoption of toothbrushing and healthy dietary habits and restriction of sugar. Secondary socialisation takes place when the child starts school, and the peer group and teachers play an important role in determining behaviour.

There are important social differences in the way sugar is used in different sectors of society. Children in deprived areas get sweets more frequently, sweets being used to pacify the child, or because the child demands them. Children in more affluent areas are more likely to get a restricted amount of sweets such as at weekends or after meals, taking into account the frequency/sugar with meals message (Blinkhorn, 1982). During adolescence, the young adult develops more and more as an individual person and begins to formulate his/her own behaviour.

Currie (Currie and Todd, 1992), in her study of the health behaviours of Scottish schoolchildren, found that 'unhealthy' or risk behaviours such as smoking and drinking were associated with one another. Children who smoked regularly were more likely to drink regularly. This is not necessarily a causal relationship, but rather similar factors influence the establishment of both patterns of behaviour in young children. In a similar vein, healthy behaviours were associated with one another, thus children who took regular exercise were more likely to eat healthy foods and brush their teeth regularly. Thus, it is suggested that a topic-based approach to health education that does not take adequate account of other aspects of health may be less effective. Generally, there is a move away from a disease-centred approach to a more positive lifestyle oriented approach in health promotion. Much dental health education in the past has focused upon information transfer, with the assumption that behaviour change will automatically follow the imparting of knowledge about tooth decay. It is now known that this assumption is incorrect and simplistic and that behaviour change is a complex process.

The oral health General Public Programme of the Health Education Board for Scotland, targeting pre-school children, parents, grandparents and carers of the under-5s aimed to raise awareness of good dental health among the target population in a positive way. It provides an opportunity for professional action at Health Board level. The content of the programme includes giving recognition that oral health care is a key part of the whole process of caring for the under-5s and focuses in on regular brushing with fluoride toothpaste and decreasing the frequency of consumption of sugary snacks. Using television, press adverts and information packs, the campaign gave information about good oral health practices and accessing services. The tone of the campaign was positive and helpful, reinforcing and not judgmental and avoided making the target group defensive. This initiative should be built on and exploited in ways which are appropriate locally. Consistent advice to use a smear or small pea sized amount of fluoride toothpaste (ideally of at least 1000 ppm) has been advocated by the Scientific Basis for Dental Health Education (1996) and is being prepared for dissemination by the Consultants in Dental Public Health in Scotland.

Continuing and appropriate action is required from the Health Education Board for Scotland, in liaising with all other parties involved in Dental and Oral Health Promotion in Scotland, in order to provide effective and integrated health promotion directed at children. A particular focus must be on children who are at higher risk to caries and more deprived than their peers, as this group has the majority of the disease. A SNAP group within the Oral Health Network is currently considering the subject of Oral Health Promotion.

## **2 DIAGNOSIS OF CARIES IN CHILDREN**

There is a major problem of different interpretations and usage of some key dental terms across different parts of dentistry which is a trap for those outside the profession as well as those within it. The disease of caries is measured in a number of different, but superficially similar, ways which can readily give rise to confusion (Pitts, 1991 a) and the inappropriate use of epidemiological and service data.

### **2.1 Measurement methods in clinical practice**

General Dental Practitioners (GDPs) use a variety of different basic methods to detect the presence and extent of dental caries which may largely reflect the particular shades of opinion held by teachers when they qualified. There have been significant shifts of expert opinion (Davis et al, 1992a) which now advocate the use of visual rather than tactile clinical methods of diagnosis and the individualised use of diagnostic aids including, where appropriate, dental radiography (Pitts, 1991b, 1991c, 1992). The GDP will recognise, detect and plan care for a range of lesion sizes (Nuttall et al, 1993) from the just discernible lesion appearing as a white area of altered translucency ( $D_1$  lesions), reliably visualised only after cleaning and drying the tooth, to small surface breaks in the outer enamel surface of the tooth ( $D_2$  lesions) and the well established lesion extending through the enamel into the dentine, the inner part of the tooth ( $D_3$  lesions).

### **2.2 Measurement methods in research**

Various new diagnostic methods are being developed and evaluated to aid the dentist in a difficult task which is becoming harder as the morphology of lesions changes and practitioners are confronted with more teeth which are apparently intact but which conceal substantial dentine lesions. Present research has demonstrated great variability between dentists in detecting and grading lesions and that many existing clinical methods are relatively insensitive in detecting lesions at the stage where early preventive interventions have the best chance of working effectively.

### **2.3 Measurement methods in epidemiology**

It must be appreciated that the traditional level of measurement in dental epidemiology has been an established lesion into dentine requiring a filling. Recording at this comparatively gross level is essential if survey results are to be compared with other countries and with surveys conducted previously. However, the fundamental difference between recording at the dentine ( $D_3$ ) level, which is used in the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP) and the UK Surveys, and the more sensitive ( $D_1$ ) level, used by clinicians, must be appreciated (Pitts and Fyffe, 1988). As an example, in regularly attending 12-year-olds the mean number of Decayed, Missing and Filled Teeth (the so-called DMFT Index; dmft for primary teeth) was found to be 1.0 at the  $D_3$  'survey' level but 11.8 at the  $D_1$  'clinician' level (Pitts et al, 1993). A further complication is that open cavitation has become more of a rarity and epidemiological criteria have had to evolve to reflect this change in the presentation of disease (Pitts, 1993). The inaccuracies of

making simplistic predictions of subsequent dental treatment on the basis of epidemiological data collected at the dentine (D<sub>3</sub>) level has been demonstrated (Nuttall and Davies, 1988).

Given the above and the existence of the national targets, it is imperative that all concerned understand that many children who are described as 'caries free' on the basis of an epidemiological assessment are very likely to **have** dental caries needing preventive or restorative care when measured at the diagnostic thresholds employed by clinicians in the General Dental Service (GDS) or in the Community Dental Services (CDS). It is also important that locally appropriate methods of obtaining information at a small area level (that is smaller than the representative Health Board sample used for the SHBDEP surveys) are developed in all Boards in order to inform purchasers and providers about the impact of services upon the high risk groups that can be defined (Dowell et al, 1992).

#### **2.4 Measurement methods in screening/oral monitoring**

This activity uses an even more gross assessment of caries status than the epidemiological measures. A traditional 'medical' definition of screening is the presumptive identification of unrecognised disease or defect by the application of tests, examinations or other procedures which can be applied rapidly. Thus, in a dental context, screening for caries is a rapid inspection of the oral cavity carried out on large numbers of subjects by a dentist using a mouth mirror and sufficient illumination to ensure good observation. Positive screening results merely mean that further investigations are necessary.

Screening may involve the entire group or may be selective and applied only to high risk subjects of the group. A well organised screening programme should respond to four main quality issues: cost, effectiveness, frequency and the use of a protocol. Guidance to Health Boards on the Future Role of the Community Dental Service in Scotland (SHHD/DGM (1989) 15) stated that screening of the teeth of children in state funded schools should take place at least three times in each child's school life (in areas of poor dental health and where availability of services is poor, such screening may need to be more frequent). This has been endorsed by the recent circular NHS 1997 PCA(D)10 and by a recent review of Health Services in Schools (SODoH, 1996).

Decisions should be made locally about who should be screened and how often, in order that the dental health of sections of the community most at risk will be protected. Although dental screening is carried out in every Health Board area, there is no uniform methodology in existence which might allow more critical comparison of ISD(S) 23 screening statistical returns on an inter-Board and national basis. Indeed this whole area could be reviewed as the importance of identifying the risk groups who suffer the majority of the disease becomes clearer.

The main objective of screening is to detect dental disease or anomaly and, where evidence of this is found, to refer the individual for full examination and eventual treatment. Screening can, therefore, give some information on the proportion of a group requiring investigation and treatment at a given time, as well as the (apparent) number with "zero caries" as defined on

ISD(S) 23. Screening cannot, however, give detailed epidemiological information, such as caries prevalence.

Dental screening has the ultimate aim of promoting improvement in the dental health status of the individual and the community as a whole. It has been shown to be most effective in areas of high unemployment, where disease levels tend to be highest, there is a low level of service availability and the normal attendance rates are low prior to screening (Zarod and Lennon, 1992). Alternative methods of screening looking at attitudes, behaviours and attendance are being advocated and should also be explored.

### 3 EPIDEMIOLOGY OF CARIES IN CHILDREN

#### 3.1 Prevalence of disease in key age groups

Since 1987 dental caries prevalence throughout Scotland has been monitored by the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP) which is a joint venture between all 15 Health Boards (mediated through the CADO/CDPH Group) and Chief Scientist Office's Dental Health Services Research Unit in Dundee (Pitts and Davies, 1992). The annual reports of the Programme's surveys are available in all Boards and detail the findings (Pitts and Davies, 1988; Pitts and Davies, 1989; Pitts and Davies, 1990; Davies and Pitts, 1991a; Davies and Pitts, 1991b; Pitts et al 1992; Pitts et al, 1993; Pitts et al, 1994; Pitts et al, 1995; Pitts et al, 1996; Pitts et al, 1997). The SHBDEP surveys are co-ordinated with those carried out across the rest of the UK through the British Association for the Study of Community Dentistry (Nugent and Pitts, 1997). These surveys regularly demonstrate that, along with their peers in Northern Ireland, Scottish children have more caries than their contemporaries elsewhere in the UK.

Examinations of randomly selected samples from each Health Board are conducted by 40 teams who, each year, attend a formal training and calibration course. Clinical examination is conducted in schools using a mobile examining light and mirror, a predominantly visual technique with no supplemental diagnostic aids; caries is recorded at the dentinal level.

In 1987-88 a representative sample of 4472 5-year-old children was examined, the corresponding figures for 1989-90, 1991-92, 1993-94 and 1995-96 were 4401, 5001, 5920 and 7007. The weighted mean  $d_3mft$  for Scotland were: in 1987-88 = 2.73 (range of Health Board means 1.86 -3.40); in 1989-90 = 2.82 (range of means 1.88-3.65); in 1991-92 = 2.88 (range of means 1.68-3.34); in 1993-94 = 3.20 (range of means 2.11-4.25) and in 1995-96 = 2.93 (range of means 2.16-3.50). The percentages of children 'free' of caries experience at the dentinal level of diagnosis in 1987-88, 1989-90, 1991-92, 1993-94 and 1995-96 were 42.4%, 40.8% and 41.8%, 38.2% and 41.4% respectively. The weighted mean number of teeth with 'unrestorable decay' decreased slightly from 0.40 in 1991-92 to 0.26 in 1995-96, while the mean "f" component declined to a low of 0.23 in 1995-96 from a high of 0.52 seen in 1989-90.

The results of surveys of 5-year-olds provide the most sensitive barometer of change. It should be noted that the distribution of disease is now markedly skewed and that most of the disease is in a minority of the children. For example in 1995/96 50% of the disease experience ( $d_3mft$ ) in 5-year-olds was found in 15% of the children (Table 1). Therefore, it would seem appropriate to increase preventive activities focused upon those with most disease. Tables 1 and 2 highlight, for 5-year-olds and 12-year-olds respectively, the skewed distribution of dental caries among Scottish children. There is also a wealth of literature linking those groups of children and adults at high risk to dental caries and treatment with low social class (Eddie and Davies, 1985) and deprivation (Sweeney et al 1996).

### 3.2 Trends in caries experience

Figure 1 summarises the trends in caries prevalence in 5-year-olds over a 13 year period. It is evident that although caries experience was declining satisfactorily between 1983 and 1987-88, more recent data suggest that this decline has ceased. Figure 2 presents the trend data for 12 year olds over the same period. The rate of decline for this age group has also slowed. BASCD data from other high caries areas in the United Kingdom also demonstrate the same trends (Nugent and Pitts, 1997), even though the mean levels in England are substantially lower.

**Table 1**

Skewed distribution of decay for 5-year-olds in Scotland, 1995/96. Decay ( $d_3$ ) measured at the caries into dentine level.

<b><math>d_3</math> surfaces</b>
1% of population had 10% of decayed ( $d_3$ ) surfaces 10% of population had 50% of decayed ( $d_3$ ) surfaces 54% of population had 100% of decayed ( $d_3$ ) surfaces
<b><math>d_3</math>mft</b>
6% of population had 10% of decayed, missing or filled teeth ( $d_3$ mft) 15% of population had 50% of decayed, missing or filled teeth ( $d_3$ mft) 59% of population had 100% of decayed, missing or filled teeth ( $d_3$ mft)

**Table 2**

Skewed distribution of decay for 12-year-olds in Scotland, 1996/97. Decay ( $D_3$ ) measured at the caries into dentine level.

<b><math>D_3</math> surfaces</b>
2% of population had 25% of decayed ( $D_3$ ) surfaces 7% of population had 50% of decayed ( $D_3$ ) surfaces 37% of population had 100% of decayed ( $D_3$ ) surfaces
<b><math>D_3</math>MFT</b>
2% of population had 10% of decayed, missing or filled teeth ( $D_3$ MFT) 15% of population had 50% of decayed, missing or filled teeth ( $D_3$ MFT) 58% of population had 100% of decayed, missing or filled teeth ( $D_3$ MFT)

### 3.3 Trends in the provision of care

More disturbing still is the make up of the component parts of the Decayed Missing and Filled Index. Trends here suggest that the provision of fillings has declined markedly, while untreated dentinal decay has risen. The proportion of the caries experience made up of fillings (the Care Index) has been showing a deterioration in 5-year-olds since 1991/92 and a similar pattern is now also being seen for 12- and 14-year-olds (Nugent and Pitts, 1997).

### 3.4 Targets for 5-year-olds

The national target relating to these children is that by the year 2000 "60% of 5-year-old school entrants should have neither cavities nor have had fillings or extractions" (HEBS 1991). The wording appears differently in other documents where '60% free of decay' has been used - this is a potential source of confusion (see Section 2.3).

Figure 3 demonstrates the continued lack of progress in approaching this target over the last ten years. It can be seen that in the two surveys since publication of the original SNAP Report on Dental Caries in Children no real progress has been made. Meeting this target in time is therefore unlikely.

Caries levels in 5-year-olds in Scotland are high in Great Britain terms (although low compared with some other European countries and with historical comparisons for Scotland). The falls previously seen in mean caries levels for the 5-year-old group have ceased and there has been little **overall** change between 1987-1996. Recent changes in the pattern of care are not encouraging. If the target is ever to be achieved then more concerted preventive efforts are required and a range of alternatives should be considered. Although The Oral Health Strategy for Scotland advocated fluoridation of public water supplies little progress has been made toward implementing this effective public health measure.

### 3.5 Targets for 12-year-olds

The national target relating to older children is that by the year 2005 "children aged 12 should have on average no more than 1.5 teeth decayed, missing or filled". The 1983 level was 2.18 with only four of the fifteen Scottish Health Boards having already achieved the target (Pitts et al, 1993). The 1997 D<sub>3</sub>MFT was 1.75 with seven Health Boards having now achieved the target, although this serves to indicate that there is still some way to go before "Scotland" achieves the target level of dental health for this age group (Pitts et al, 1997).

As with caries levels in 5-year-olds, those in Scottish 12-year-olds are amongst the highest in the UK and the substantial decrease which was evident between 1984 and 1993 does not appear to be continuing at the same rapid pace. SIGN are currently developing evidence-based guidelines for the appropriate targeting of preventive care for children aged 6-16 years presenting for dental care which may be of use in the clinical management of caries in older children.

### 3.6 Information for Health Services Research

The Scottish Dental Practice Board (SDPB) and Dental Practice Division (DPD) have a wealth of data relating to dental services in Scotland. Elements of these datasets should be of considerable value to Health Boards and health services researchers, now that improvements in Information Technology methodologies of collecting data from GDPs have been made. Revised information policies offer potential for using this information to secure improvements in oral health. While they are constrained by the important task of paying dentists in the GDS for claims submitted, the SDPB/DPD remit includes elements of R&D and seeking to facilitate improvements to the quality of care which should be of value in partnerships with Health Boards and health services researchers.

Under the September 1996 GDS contract, capitation payments are made to GDPs in respect of the number of children they have registered. Child item of service payments for restorations in permanent teeth and the extractions of deciduous and permanent teeth were reintroduced. On the claim forms dentists are asked to fill in the number of decayed missing and filled teeth for each child but as practitioners are provided with no criteria for this assessment there is little information about the validity of these data. The SDPB and their Dental Practice Division kindly provided the SNAP Oral Health Group with details of the capitation registration data at 31 January 1994 and the dentists' own estimates of dmf under parts 7 and 8 of the capitation forms.

These showed that there were 37,952 patients aged 5 years registered for whom it was claimed that 75,194 teeth were decayed, 9,132 were missing and 15,174 were filled. These numbers are comparable with the epidemiological findings in terms of the imbalance between decayed and filled teeth (there were approximately five times as many decayed as filled). They also accord in gross terms with the epidemiological estimates of mean dmf of the population, as a mean of 2.62 was obtained from the SDPB data as compared to the value of 2.88 from the 1991-92 SHBDEP report. However, these data relate only to the subset of the population who are registered who might be expected to have better levels of oral health. This information cannot be used reliably at lower levels (i.e. by Health Board), because of the lack of guidance to GDPs about what criteria to use when completing this part of the claim and the unknown influence of the previous "weighted entry payment system" for high caries children.

It would seem highly desirable to improve the quality of the information held about children treated under capitation, to exploit the potential of the new electronic data capture methods and for the SDPB to work with Health Boards and others to make sure that the information can be fully used within the National Health Service. The number of registrations for 5-year-olds and younger children are still disappointingly low and efforts must, therefore, be made to improve attendance of very young children who should visit a dentist no later than when the first tooth appears in the mouth. There are, however, examples of local initiatives with dental practitioners and health visitors which can boost these rates (Pine and Deas, 1997).

### **3.7 New information available and awaited imminently**

Since the publication of the original "Dental Caries in Children" SNAP Report in 1994 a number of awaited publications have appeared including The Oral Health Strategy for Scotland (SODoH, 1995) and the results of the 1993 Office of Population Censuses and Surveys UK Survey of Children's Dental Health (O'Brien, 1994). New SHBDEP Reports on the dental health of 5-, 12- and 14- year olds are now available (Pitts et al, 1994, 1995, 1996, 1997) and these, along with The National Diet and Nutrition Survey of children aged 1.5-4.5 years (Hinds and Gregory, 1995) and a recent SHBDEP Addendum on Deprivation and Dental Caries (Sweeney et al, 1996) will also inform the debate. Similarly, the recent White Paper *Designed to Care* (SODoH, 1997) will have a direct bearing on both central policies and the future contracting framework, while the Green Paper on Public Health in Scotland (SODoH, 1998) and the Personal Dental Services pilots will also have an impact in due course. The result of a Chief Scientist Office funded study into caries risk assessment of infants by Health Visitors should be available within the next year.

## **4 ORGANISATION OF DENTAL SERVICES FOR CHILDREN**

Overall, the large majority of children who attend dental services (70-80%) see a General Dental Practitioner. Unfortunately, however, not all children attend sufficiently regularly and in 1996/97 only 56% of 3-5 year olds and 67% of 6-12 year olds were registered with the General Dental Service (GDS). The main source of primary dental care is the GDS although there is significant contact with children through the Community Dental Services in the screening, health promotion and treatment programmes. However, evidence suggests that although it is difficult to ascertain which children need and get appropriate dental care, those children who have high caries experience and risk may not be currently receiving it (Pitts, 1997).

### **4.1 General Dental Service (GDS)**

The General Dental Practitioner service is the main primary care dental service. The majority of General Dental Practitioners are independent contractors who can treat children and young people below 18 years of age under a hybrid capitation agreement. In September 1996 the original capitation contract was replaced with a modified contract in which the capitation payment is supplemented by item-of-service fees for certain treatment procedures. This agreement allows for the provision of a full range of free dental care including examination, curative and preventive treatments as well as some more complex restorative and orthodontic procedures.

The dentist is remunerated for the routine care provided under capitation by a monthly fee related to the age band in which the patient is placed. In addition, there is a range of item of service payments available for conservative treatment, extractions, endodontics, general anaesthesia and so on. There is, however, at present no separate fee for a preventive fissure sealant. The monitoring and authorisation of payments is carried out for the service by the Dental Practice Division (DPD) of the Common Services Agency (CSA) on behalf of the Scottish Dental Practice Board (SDPB). Practitioners may also treat children outwith capitation on an 'occasional' basis usually for emergency problems.

Individual General Dental Practitioner contracts are held by the Primary Care Department of Health Boards. General Dental Practitioners are professionally represented on Area Dental Committees of Health Boards typically through members elected from those working within a Health Board.

General Dental Practitioners are independent contractors who can choose whether or not to treat children under the National Health Services Capitation Agreement. In addition, there is no restriction on where a dentist may practice and this is often dictated by market forces. Due to these factors, it is therefore difficult to plan general dental services to reflect the needs of the community.

Legislation following publication of the White Paper "Choice and Opportunity" (SODoH, 1996) allows Health Boards, Trusts and dentists to formulate plans for the piloting of alternative forms of contracting for services

(Personal Dental Services) in order to meet local needs more effectively. These are to be piloted shortly.

#### 4.2 Community Dental Service (CDS)

The Community Dental Service is a directly managed service in which the staff are remunerated by salary. As a directly managed service provider, the Community Dental Service should be able to negotiate, agree and deliver service agreements with the commissioner which will accurately reflect the health needs of the population and which will contain appropriate quality measures.

There has been considerable organisational change to the service as a result of the recent National Health Service changes. In 1989, the Scottish Home and Health Department circulated in SHHD/DGM (1989) 15, guidance to Health Boards on the Future Role of the Community Dental Service. Two important functions were identified in this circular.

The first was a **public health element**, to include screening, health promotion and preventive public health programmes.

Preventive dental services for children are delivered to groups in nursery, playgroup and school settings in addition to individual clinically-based preventive activity.

Given recognition of the increased importance of oral health promotion, Community Dental Services may seek to develop Senior Dental Officer (Health Promotion) or Dental Health Educator/Oral Health Promoter posts. This will help to improve the effective organisation and delivery of oral health promotion by the Community Dental Service. It will also facilitate the involvement and co-ordination of other health professionals and agencies in the local community. The creation of Health Promotion Specialist posts within generic Health Promotion Departments is another option which provides the integration of oral health within general health.

The second function was the **treatment objective** of the service, identifying the shift more towards complementing the General Dental Service by identifying special needs groups and acting as a safety net treatment service for those patients who cannot or will not obtain treatment from the General Dental Service.

Patients may be treated in health centres, clinics or mobile units. The latter are particularly useful in improving access for children in remote areas or in urban areas where there is no locally available General Dental Practitioner. Increasingly, general anaesthetic services provided by the Community Dental Service are sited in hospital locations in the interests of patient safety and to facilitate the treatment of patients with special needs.

These functions have been retained, along with an enhanced 'safety-net' role, in the recent circular NHS 1997 PCA(D)10.

### **4.3 Hospital Dental Service (HDS)**

These services are supplied throughout Scotland in district hospitals, large teaching hospitals, regional specialist units and in dental teaching hospitals.

The traditional dental specialities of orthodontics and oral and maxillo-facial surgery are present in most district hospitals. Restorative dentistry, oral medicine and paediatric dentistry are specialities based mainly in dental teaching hospitals with limited outreach services to other hospitals and Health Boards.

The majority of work undertaken in the dental specialities is out-patient based. In-patients make a major contribution only to the work of the oral and maxillo-facial surgery speciality. Children are a major component of the work of the specialities of paediatric dentistry and orthodontics but a minor part of other specialities.

The service is a salaried service provided through National Health Service Trusts throughout Scotland. The size distribution and structure of these services will vary considerably throughout Scotland. Access to these Hospitals will therefore also vary depending upon geographical location. Edinburgh now has no dental undergraduate teaching commitment but retains a Dental Institute with paediatric dental services, while Dundee and Glasgow remain as Dental Teaching Hospitals with associated Dental Schools.

## **5 PREVENTION OF CARIES IN CHILDREN**

### **5.1 Population Measures/Public Health Programmes**

#### **5.1.1 Water Fluoridation**

The term 'water fluoridation' refers to the adjustment of the fluoride concentration in community water supplies in a northern, temperate climate to one part per million. The effect of fluoride (in water supplies) on caries was established in the 1930s. A caries survey carried out in 21 American cities showed an inverse relationship between caries levels and water fluoride concentration. Water fluoridation schemes have been in existence since 1945, and in a review of 113 studies into the effectiveness of water fluoridation in reducing caries levels in 23 countries (Rugg-Gunn and Murray, 1991) it was found that the modal percentage reduction was 40-49% for deciduous teeth and 50-59% for permanent teeth. Thus both dentitions are affected and the benefits last throughout adult life. The recent SNAP report on Adult Oral Health recommended that the promotion of water fluoridation should continue and acknowledged the long term benefits throughout life (Taylor et al, 1997).

Community water fluoridation schemes provide the greatest benefit to those in greatest need. For children with negative oral health behaviour, water fluoridation can reduce their unequal experience of dental disease (Carmichael et al, 1984).

Compared with other strategies for reducing caries, water fluoridation has been shown by many studies, in many countries (Birch, 1990) to offer the most cost-effective approach. A recent economics perspective on water fluoridation by the York Health Economics Consortium (Sanderson, 1997) indicated that the benefits of fluoridation were significantly greater than the costs where the average  $d_3mft$  of 5-year-olds was  $>2$  and where local water treatment works served populations of 200,000 people or more. In such a situation the annual benefits per person exceed the annual cost by at least 17p.

The safety of water fluoridation has been endorsed by all major national and international professional bodies as well as the World Health Organisation.

Currently, enabling legislation governing the introduction of fluoridation of community water supplies (The Water [Fluoridation] Act 1985) requires that the public must be informed before any final decision is taken on the subject. Despite this enabling legislation, no water fluoridation scheme exists in Scotland and no Health Board has successfully advanced towards this goal.

In the absence of additional legislation which would make it mandatory for water supplies to implement the request of a Health Board to adjust the fluoride levels of water, it may not be possible to progress this valuable public health measure successfully.

Water fluoridation remains the method of choice on the grounds of effectiveness and cost. Health Boards should explore and stimulate the level

of consumer demand for this effective public health measure and work with appropriate agencies to seek early implementation. Health Boards should continue to promote the concept of water fluoridation by raising public awareness of and support for the positive issues involved. This will help to educate voters, civic and government leaders to accept and, in turn, make a positive decision to implement water fluoridation as a safe and effective way to reduce inequalities in health. The recent Green Paper (SODoH) provides a route forward for this important consultation. Additional preventive strategies must also be pursued and these should recognise the skewed distribution of disease in the population. They become even more important when water fluoridation has yet to be implemented.

### **5.1.2 Other Public Health Measures**

**Fluoride Toothpaste** - Fluoride toothpaste use has increased considerably in the last 30 years. In 1970 only 10% of toothpaste was fluoridated but present figures would suggest 95% of toothpaste contains fluoride. The extensive use of fluoride in this formulation could be considered as a public health measure which many researchers feel has been a major factor in the recent downward trend in caries prevalence (Renson 1989, Bratthall 1997). There is an increasing consensus that, as young children from deprived groups apparently still have very limited access to toothpaste, public health programmes for high caries risk groups aimed at providing daily access to fluoride from this vehicle via the well accepted route of toothbrushing should be encouraged and should form a major part of any local oral health strategy.

**Fluoride Drops and Tablets** - In areas where water is not fluoridated, the administration of a tablet or drops, *if* used as advised, is effective in preventing dental caries in both deciduous and permanent teeth. Effectiveness of supplements is greater the earlier the child begins taking the fluoride supplements.

Driscoll (1974) summarised 21 studies of such programmes and reported consistent benefit of between 50-80% reduction expected in both dentitions if supplementation commenced at 2 years or younger. Entry into these schemes later produced less benefit. The greatest difficulty with such programmes, when viewed as a public health measure, is the inability to maintain co-operation over a period of 10 years in a large proportion of the population. A recent review of fluoride supplements concluded that they were not an effective public health measure. Nevertheless, those individuals in high risk groups who are predisposed to dental decay can benefit from use of fluoride supplements taken under the direction of a dental or medical practitioner if they can be persuaded to maintain the regime over an extended period. An agreed dosage schedule for fluoride supplements in Scotland has been recommended by the Consultants in Dental Public Health (CDPH, 1998).

Ways of increasing compliance in the pre-school age group should be reviewed and such programmes should be targeted at high caries risk individuals under the overall care of clinicians. Experience from such countries as Norway shows that tablets can be introduced successfully through 'well-baby' clinics where the proportion of young children taking

supplements increased from 1% to 50% in 5 years, (Lokken and Birkeland, 1978). Although a consistent policy on dosage schedules has been produced by the consultants in Dental Public Health Group, the difficulties in this area must be recognised as there are increasing numbers of regimes recommended by different scientific organisations.

**Fluoridated Salt** - This route of supplying fluoride has found favour in a number of European countries, notably Switzerland and most recently France and is recommended by the WHO. It is an attractive vehicle in many ways as the precedent of iodised salt is established and the aim is only to maintain medically acceptable levels of use rather than increasing consumption. As suggested in the Oral Health Strategy for Scotland fluoridated salt (as potassium fluoride rather than sodium fluoride) may have a role to play as part of an overall fluoride policy and should be available as a substitute for existing salt intake based on individual choice.

**Behavioural Changes** - Oral and dental health is obviously affected by the behaviours of the children and the parents. The major areas affecting dental health of school children are:-

- |                            |  |
|----------------------------|--|
| use of fluoride toothpaste | - see above affecting tooth decay  |
| dietary habits             | - high sugar intake causing dental decay                                     |
| oral hygiene               | - directly related to periodontal health                                     |
| dentist visiting pattern   | - related to treatment patterns of both dental decay and periodontal disease |

**Diet** - The diet of Scottish school children has been shown to be poor (The Scottish Diet, 1993), high in fat and sugar, low in fruit and vegetables. This poor diet is a major contributory factor to the poor oral health seen in Scotland compared with other parts of the United Kingdom.

Problems start in early childhood with low levels of breast feeding and early weaning on high sugar products such as baby juices leading in some cases to diagnosis of rampant caries where children of 2 and 3 years of age have decay in multiple teeth. McNeil et al (1991) showed a high percentage (29%) of energy from sweetened foods such as confectionery, cakes and sweet drinks in the diet of Dundee schoolchildren as compared with recommended lower levels. Prevalence of caries has been directly correlated with the amount and frequency of consumption of non-milk extrinsic sugar in the diet and health behaviours of Scottish school children. Currie and Todd (1992) showed that two thirds of the Scottish school children sampled aged 11 to 15 years consumed sweets and sugar-containing fizzy drinks every day, with these two latter products forming an increasing proportion of the adolescent diet over the last ten years (Rugg-Gunn et al, 1993).

It is important that advice on changes of the diet should take place on a population basis using mass media as well as being part of individual counselling. This advice should be an integral part of health education programmes throughout Scotland. The potential role of local food policies should be reviewed.

A national strategy for delivering the dietary targets based on the James Report's recommendations has been developed by the Scottish Diet Action Group (SODoH, 1996). It stresses in relation to oral health the need to establish links with pre-5 establishments and Primary and Secondary schools to ensure a dentally healthy diet. Health Boards should also encourage health professionals, and in particular health visitors, to provide appropriate dietary advice to parents of children under 5 years of age.

***Toothbrushing/Oral Hygiene*** - Overall, toothbrushing frequency has increased considerably over the last 30 years. In the 1993 Survey of Children's Dental Health in the United Kingdom, approximately 95% of children in all age groups interviewed **claimed** to clean their teeth at least once a day or more frequently. This has allegedly had an effect on periodontal disease, with no severe pocketing being found and only 10% of 15 year olds in the United Kingdom demonstrating any pocketing in the OPCS Report in 1993 (O'Brien, 1994). There is, however, concern that actual behaviour differs markedly from reported behaviour, particularly in more deprived groups.

Toothbrushing has become an established behaviour and consideration should be given to extending the use of this principle to the pre-school groups with once a day brushing (starting as young as possible once teeth are erupted) using a fluoride toothpaste to act as a preventive measure against dental decay. Supervised brushing in schools is also an attractive option where feasible and appropriate.

***Dental Attendance Patterns*** - These patterns vary with age but attendances increase throughout the primary school age to a maximum in early teenage life. Claimed 'regular' attenders have been recorded at approximately 60% of 12 year olds, however, some other reports suggest that 95% of children have attended a dentist within a period of one year. The OPCS 1993 Child Dental Health Survey (O'Brien, 1994) showed that among 5-year-olds there was an average of 0.9 active decayed deciduous teeth among 'regular' attenders and 2.2 active decayed deciduous teeth among those who only claimed to attend the dentist when in trouble. Neither figure shows an improvement from the 1983 OPCS Survey (Todd and Dodd, 1985). Although this may not be a cause and effect situation, dental attendance could be an important factor in controlling dental decay if a broad spectrum of preventive measures are targeted at the individual during dental attendances. Unfortunately, one of the few studies to longitudinally validate children's attendance found that the unsatisfactory infrequent attendance patterns seen in Scottish adults seem to be well established in late adolescence (Nuttall and Davies, 1992). In order that regular dental attendance patterns are established in children it is important that parents and carers are aware of their responsibility to register their child with a dentist as soon as possible and not later than when the first teeth appear in the mouth.

## 5.2 Small Group Preventive Measures

Numerous papers have evaluated various preventive measures used on small groups. The majority of these papers are based on school programmes where positive measures are targeted at groups and applied at regular intervals.

**School Water Fluoridation Programme** - Fluoride levels significantly above that of community fluoridation programmes (5 parts per million) have been recommended and overall improvements in caries experience range between 39.5% and 47.6%. This technique may have some potential in rural areas, however, the safety and cost of such a scheme in smaller establishments is questionable.

**Fluoridated Milk** - The absorption of fluoride from water and milk is similar but this vehicle has not been instituted on a community basis because of considerable logistic problems and the variability of intake. Stephen et al (1984) showed, in a test group in Glasgow, reductions of approximately 43% caries experienced compared to the control group. Further trials are underway but this measure has yet to attract widespread support.

**Fluoride Tablet Schemes** - In order to improve the uptake of the fluoride tablet various schemes have been introduced, usually in a primary school setting between the ages of 4-5 and 10-11 years. These types of programmes have negligible effect on the deciduous teeth of 5-year-olds and have shown varied results between 40% and 80% in permanent teeth (Stephen, 1993). The recommendations for fluoride supplementation set out by the Consultants in Dental Public Health in Scotland (1998) should be used if such schemes are mounted.

**Fluoride Rinsing Programmes** - These have used variable concentration of fluorides and frequency of use. Rinsing once per week or more often is likely to be more effective than less frequent rinsing. A rinsing time of 1-2 minutes appears suitable for all ages from about 5 years onwards. Rinsing is not suitable for children under this age due to concern with young groups ingesting a solution not designed for systemic use. Certain fluoride rinsing schemes have shown caries reductions of 25% to 69% (Murray et al, 1991).

## 5.3 Individual Programmes

Individual programmes usually divide into two major areas - self-applied fluoride preparations such as toothbrushing or rinsing and professionally applied preventive measures such as fluoride gels, fluoride varnish or fissure sealants. The benefits of fluoride toothpaste, the most widely used means of administering fluoride, are considered to be responsible for reducing trends in caries over the last 30 years (Renson, 1989, Bratthall 1997). The effectiveness of fluoride toothpaste has been shown in numerous clinical trials with a wide range of fluoride preparations.

**Professionally Applied Fluoride** - Topical fluoride therapy has been researched over many years and effectiveness in reducing caries has been shown to vary from 0-75% in a wide range of trials employing varying

methods and designs. The agents employed include: Sodium Fluoride Solution, Stannous Fluoride Solution, Acidulated Phosphate Fluorides and Fluoride Varnishes. Fluoride gels, which were previously very popular, have largely been replaced by fluoride varnishes which are strictly for professional use only with caries reduction of between 7%-56% in deciduous teeth and 10%-75% in permanent teeth (Murray et al, 1991).

**Combinations of Fluoride Therapies** - Various combinations of fluoride therapies have been recommended in low fluoride areas combining fluoride tablets, varnishes, mouth rinsing and so on. Care has to be taken with this multiple prescribing and there are no papers which have identified the benefits of the various components in such regimes.

**Fissure Sealants** - The placement of fissure sealants has been shown to be a highly effective means of controlling caries in the occlusal fissures which have been traditionally recognised as vulnerable to dental decay (Stephen and Strang, 1985; Murray, 1989). It is recommended that such preventive measures are used in combination with fluoride regimes which would be an adjunct to the treatment and help the control of smooth surface caries. The assessment of the effectiveness of fissure sealants is complex with data published which review both the effectiveness in reduction of caries and also their retention on the total surface over a period of time. One of the more recent long term studies by Simonsen (1991) over 15 years reported that in the sealed group only 31.3% of teeth were carious or restored, compared with 82.8% in the non-sealed group.

Many groups have tried to identify children most at risk of fissure caries and recommend fissure sealants for these targeted individuals. The British Society for Paediatric Dentistry (BSPD) in 1993 identified these groups:-

Children with special needs - fissure seal all occlusal surfaces.

Children with extensive caries in primary dentition should have all permanent molar teeth sealed as they erupt.

Children with occlusal caries in one first permanent molar should have the fissures of the sound first permanent molars sealed.

Children who have caries in one or more of their first permanent molar teeth should have their second molar teeth sealed on eruption.

The recent "Abolish Carious Teeth" (Stephen and Hesketh, 1996) distance learning pack (the ACT Pack), recommended wider sealant use in Scotland:

- For at risk children, apply fissure sealants to the newly erupted second deciduous molars (Es).
- For all children, apply fissure sealants to the first permanent molars as soon as they are fully erupted.

The Scottish Intercollegiate Guideline Network (SIGN) is preparing an evidence based set of recommendations on targeted prevention for 6 - 16 year old children presenting for dental care. As strong evidence supporting

the use and maintenance of sealants has been demonstrated their use can be advocated and adoption of the SIGN guideline should be considered widely.

## **6 TREATMENT OF CARIES IN CHILDREN**

### **6.1 Changing concepts of ideal treatment**

There has been a change of concept in dentistry over the past 40 years. The profession has emerged from a phase when extractions for the relief of pain were the norm, through a stage when restoration of damaged teeth (to save them from extraction) was the aim, to a more preventive era. Care now aims to ensure that restorative intervention is avoided if at all possible and for as long as possible. This is in order to avoid the (now) known pitfalls associated with costly re-restoration and maintenance of fillings which have proved to be an imperfect replacement for sound tooth tissue (Elderton, 1985; Elderton et al, 1985; Elderton and Eddie, 1986; Pitts, 1991d).

Where progressive dentinal caries is present it is important for the individual patient that a 'preventive restoration' is provided in the context of secondary prevention. The filling is provided as the rehabilitation part of a preventive package which strives to modify the causative factors to prevent recurrence of decay. This is in contrast to the previous practice in which some dentists and patients regard the filling as a cure for the disease. There is a large educational task required to update the public and many members of the dental and other health professions about this change in ethos. Appropriately constructed and locally relevant distance learning programmes to GDPs (Davis et al, 1992b) have been effective and should be developed further.

Too many teeth are still being extracted and comprehensive prevention is not being delivered in many settings. The Care Index, which provides a measure of the proportion of decay experience ( $d_3mft$ ,  $D_3MFT$ ) which represents provision of restorative treatment ( $ft$ ,  $FT$ ) has been falling in all three age groups examined in the SHBDEP surveys of children's dental health indicating an increase in untreated dentinal disease in these children.

### **6.2 Dental General Anaesthetics in Scotland**

Scotland has traditionally had high numbers of general dental anaesthetics used during the treatment of dental disease. With children, these anaesthetics were mainly for the extraction of teeth and were primarily done in the general dental services. Although major reductions have been recorded over the last two decades the present level of potentially avoidable anaesthetics still appears to be far too high. The reductions seen to date are due in part to the reduction in dental disease but also follow changes in legislation concerning operator-anaesthetists and latterly the recommendations of the working party into general anaesthesia, sedation and resuscitation in dentistry (Poswillo Report, 1990). In a number of areas in Scotland anaesthetics clinics have been established in the light of the Poswillo Report. Because of the risks involved it is imperative that appropriate standards are maintained in all aspects of anaesthesia and sedation.

In order to reduce the exceptionally high incidence of general anaesthetics, especially in young children, it is considered that major behavioural changes

are required in pre-school groups aimed at the diet, use of fluoride and alternative treatment therapies to extractions. Where treatment such as extractions are necessary, use of adjuncts such as inhalation sedation should be preferable to general anaesthesia.

## 7 COSTS AND RELATED ISSUES

In many areas of dental services we do not have sufficient information on costs to carry forward meaningful analyses. Although the current systems with priced care for adults holds out the potential for such studies, the lack of detailed treatment information for children is a major barrier. There is some information about preventive programmes.

It has been shown (Burt 1978) that cost-effectiveness decreases as one moves from water fluoridation to school programmes to individual measures. Similarly, self application is less expensive than ancillary treatment and then in turn professional application by a dentist. There is undoubted evidence that overall, the most cost-effective fluoride therapy is that of water fluoridation, especially in comparison to other methods. However, given the lack of progress on this issue in Scotland, all strategies have to be considered.

In general terms the cost-effectiveness of various methods of prevention increase with the size of the target population. However, targeting of these types of treatments if undertaken effectively can reduce 'wasted treatment' on people who would not have succumbed to disease and increase the cost-effectiveness of these procedures. Accurate caries risk classification is still problematic and the most effective means of targeting may be on an individual basis, following an assessment by a dental surgeon who can then decide on a regime which is directly related to the risk to that child. The use of fluoride toothpaste with targeted groups has already been discussed and represents another potentially cost-effective strand.

In addition to preventive adjuncts (such as fluoride) or clinical treatments (such as fissure sealants), the other major public health approach has been health education and the encouragement and facilitation of behavioural change. These type of programmes either alone or in conjunction with clinical preventive strategies have traditionally been difficult to evaluate. The cost-effectiveness of some of these programmes and campaigns to change health related behaviour is, in terms of changes in disease state, rather unsatisfactory although changes in attitude and behaviour have been demonstrated.

Commissioners should ensure that they agree only preventive programmes with stated aims and objectives which are capable of being monitored and evaluated. Wherever possible the programmes should be evidence-based. The forthcoming SNAP Report on Oral Health Promotion should assist in the identification, deployment and evaluation of appropriate oral health promotion strategies.

Economic analyses of care under the revised GDS contract are needed to inform any comparisons with pilots of alternative arrangements. Effective local strategies should underpin the delivery of The Oral Health Strategy for Scotland.

## **8 STRATEGIES FOR THE FUTURE**

Following the publication of The Oral Health Strategy for Scotland, the White Paper Designed to Care and the Green Paper underlining the importance of prevention in all parts of the NHS in Scotland, specific “Action Points” should be identified by Health Boards and the other agencies identified in the Strategy document and in the Diet Action Plan for Scotland, to ensure that they are all contributing to delivering the aims of the Strategy through an efficient, co-ordinated, multi-agency response, as well as playing their part in achieving the specified targets. Such actions should reduce the preventable burden of dental caries in children in Scotland.

Having reviewed the Report after four years, the Dental Caries in Children SNAP Group find that the climate of change continues apace. We were able, however, on the basis of what has been set out above, to make a series of recommendations which we feel are important and relevant, whatever the detail of the next series of new developments may be.

These recommendations appear in section 9 of the Executive Summary. The next task will be to review these once again after an appropriate interval.

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