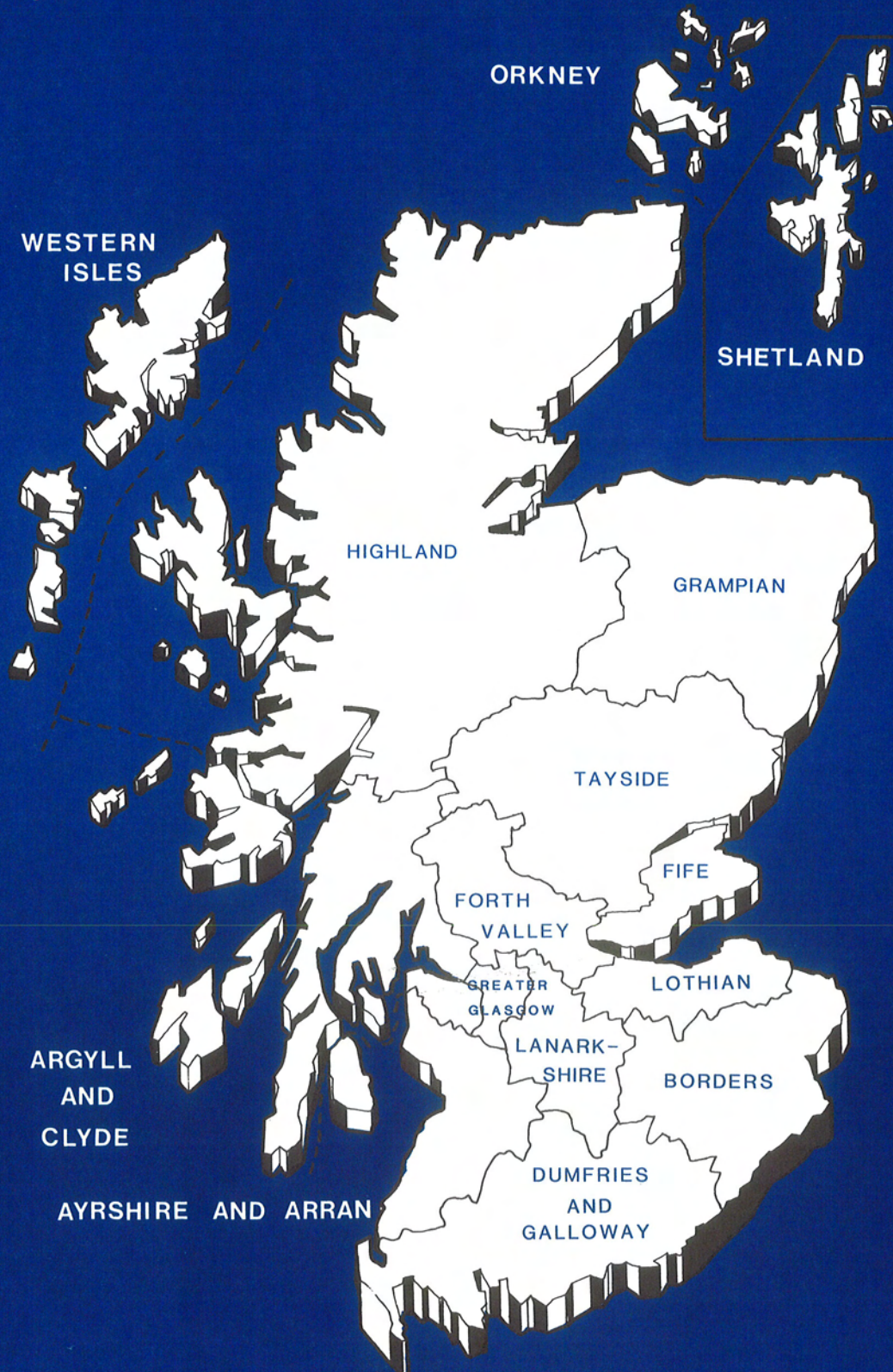


# SCOTTISH HEALTH BOARDS' DENTAL EPIDEMIOLOGICAL PROGRAMME



1990 / 91 REPORT

Prepared by  
Dental Health Services Research Unit  
University of Dundee



SCOTTISH HEALTH BOARDS' DENTAL EPIDEMIOLOGICAL PROGRAMME

REPORT OF THE 1990/91

SURVEY OF FOURTEEN YEAR OLD CHILDREN

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of the  
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Overview

The Scottish Health Boards' Dental Epidemiological Programme is now in its fourth year, thus completing the first cycle of planned surveys - 5 year olds in 1987, 12 year olds in 1988, 5 year olds in 1989 and now the 14 year olds in 1990. The second cycle will commence in November 1991 when 5 year olds will again be examined.

As in previous years, central training and calibration courses for all examiners were undertaken in Perth in November. The survey itself was undertaken in November and December 1990.

The overall caries results for 14 year olds in Scotland showed, as was to be anticipated, some deterioration from that observed for the same children when 12 years of age in 1988. The 1990 weighted mean for decayed (cavitated), missing (due to caries) and filled (amalgam, synthetic or obvious sealant restorations) gave a value of DMFT = 3.6, compared with the result for 12 year olds of DMFT = 2.2. By comparison Scottish 14 year olds and 12 year olds were recorded as having a DMFT value of 6.8 and 4.5 respectively in the 1983 survey conducted by the Office of Population Censuses and Surveys. Thus, while the 1990 value of 3.6 shows a substantial improvement on earlier figures for 14 year olds, it nevertheless represents a deteriorating level of dental health as children progress through their teens.

The proportion of children who can be said to have suffered "caries experience" (DMFT>0) showed a corresponding increase from 1988, (77.6% compared with 67.8% when aged 12). In this survey, as in previous years, a wide range of results was observed for the fifteen different Health Boards.

Whilst these figures show an improvement in the dental health of teenage children compared with the early 1980s they also show how much has yet to be achieved in the fight for acceptable levels of dental health for Scottish children.

Results for levels of oral cleanliness and periodontal status showed no significant change from those obtained two years previously at age 12. A new index for the assessment of developmental defects of enamel was employed in order to measure the size and seriousness of this problem in teenage children.

The programme is now reaching the point where useful comparisons and trends can be investigated. It is hoped that the planning of dental health services in Scotland is enhanced by the availability of the data, at both national and local levels, from this programme of annual surveys.

ERRATUM

Scottish Health Boards' Dental Epidemiological Programme.  
Report of the 1990/91 Survey of 14 year old children.

Appendix D. Table D2. Page 21. CPITN results. *The last line of the table should read*

SCOTLAND            45   35   18   2   0   4.27   1.01   0.29  
(weighted values)

### Participating Health Boards

|                       |                 |
|-----------------------|-----------------|
| Argyll and Clyde      | Greater Glasgow |
| Ayrshire and Arran    | Highland        |
| Borders               | Lanarkshire     |
| Dumfries and Galloway | Lothian         |
| Fife                  | Orkney          |
| Forth Valley          | Shetland        |
| Grampian              | Tayside         |
|                       | Western Isles   |

### The Programme

This programme of surveys is undertaken under the auspices of the Scottish Committee of Chief Administrative Dental Officers. The results contained in this report have been obtained as a result of the unstinting efforts of a large team of people from all over Scotland to whom we are grateful. Appendix A lists the participants.

### Co-ordinating Committee - Dental Epidemiology, Scotland

|                        |  |
|------------------------|--|
| Mr. T.R. Watkins*      | (Co-ordinator)   |
| Dr. N.B. Pitts*        | (Calibration and Results Co-ordinator)                     |
| Mr. M.C.W. Merrett     | (Calibration Course Organiser)                             |
| Mr. R. McKechnie       | (Representative of Consultants in<br>Dental Public Health) |
| Professor K.W. Stephen | (Adviser)  |

\* British Association for the Study of Community Dentistry (BASCD)  
Regional Co-ordinators for BASCD caries prevalence studies in Scotland.

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## 1. INTRODUCTION

The three surveys reported to date in the Scottish Health Boards' Dental Epidemiological Programme have provided much needed data on the dental health of Scottish 5 year olds, in 1987, 12 year olds in the following year and 5 year olds again in 1989 (Pitts and Davies, 1988; 1989; 1990).

Although the first two surveys showed considerable improvement in the dental health of children since the national survey of 1983 (Todd and Dodd, 1985), the third survey showed no improvement in the dental health of 5 year olds between 1987 and 1989.

This fourth survey in the series examines the dental health of Scottish 14 year old children, thus concluding the first four-year cycle of surveys (ages 5, 12, 5, 14) as originally put forward at the commencement of this programme. Work is already in hand for the first survey of the second cycle - an examination of 5 year olds in November 1991.

This report contains the detailed results for the 15 Health Boards on the dental health of 14 year olds, including caries experience, levels of decay, assessments of oral cleanliness and periodontal status and the prevalence of developmental defects of enamel. An addendum to this report, based on the analysis of the change of dental health status of the *individuals* in the sample between 1988 and 1990, will be published at a later date.

The programme adheres to the broad outline for conducting dental health surveys drawn up by BASCD, the British Association for the Study of Community Dentistry (Palmer et al, 1984; Dowell and Evans, 1988).

It should be appreciated that the results derived from this type of survey, whilst invaluable for assessing the overall prevalence of dental caries and trends over time, cannot be directly equated with treatment need (Nuttall and Davies, 1988; BASCD Working Party, 1991). This is due to a

number of factors including the more sensitive clinical diagnostic methods employed in clinical practice and the absence of radiographic information for posterior teeth. A recent analysis of data from 15 year old boys examined in Tayside in 1986 showed that bitewing radiographs increased the number of posterior lesions detected by a factor of three (Pitts, 1991).

This programme is organised via the Scottish Committee of Chief Administrative Dental Officers in conjunction with the Dental Health Services Research Unit of the University of Dundee.

## 2. SAMPLING

The sample of 14 year olds for this survey consisted of the children sampled two years previously for the survey of twelve year olds (Pitts and Davies, 1989). This decision, to do a follow through study, was taken in the summer of 1989 to enable the programme co-ordinators to set up a monitoring system in order to keep track of as many individuals as possible between the two surveys. For logistical reasons, it was agreed that any children moving school but remaining within the Health Board would be examined, but not those moving outside the Health Board. As this decision to use the same sample was made after the sampling of 12 year olds, it was too late to allow oversampling in the first survey to allow for losses between the two surveys, as well as the predicted loss (usually about 10%) for absences etc. at the time of the examination. Eighty per cent of the original sample of 12 year olds were available for re-examination at age 14 (3419 out of 4296).

## 3. TRAINING AND CALIBRATION

As in previous years, training and calibration courses were held in Perth immediately prior to the examinations. These were organised by Mr. M.C.W. Merrett in conjunction with the Dental Health Services Research Unit. Appendix B in the 1989/90 Report gave details of the organisation of such courses. The results of this year's

**TABLE 1.** Number in sample, number and percentage examined and Secondary III population in each Health Board.

| Health Board          | Sample | Examined    | Examined as % of population | Secondary III population |
|-----------------------|--------|-------------|-----------------------------|--------------------------|
| Argyll and Clyde      | 226    | 188         | 3.2                         | 5796                     |
| Ayrshire and Arran    | 339    | 275         | 6.2                         | 4450                     |
| Borders               | 139    | 111         | 10.2                        | 1087                     |
| Dumfries and Galloway | 122    | 104         | 6.2                         | 1686                     |
| Fife                  | 235    | 190         | 4.6                         | 4150                     |
| Forth Valley          | 181    | 150         | 4.7                         | 3183                     |
| Grampian              | 327    | 264         | 4.5                         | 5859                     |
| Greater Glasgow       | 540    | 417         | 4.4                         | 9500                     |
| Highland              | 177    | 130         | 5.0                         | 2617                     |
| Lanarkshire           | 520    | 444         | 6.5                         | 6782                     |
| Lothian               | 546    | 458         | 6.6                         | 6983                     |
| Orkney                | 95     | 86          | 35.5                        | 242                      |
| Shetland              | 318    | 293         | 86.0                        | 341                      |
| Tayside               | 233    | 194         | 4.3                         | 4522                     |
| Western Isles         | 123    | 115         | 26.6                        | 432                      |
| <b>Totals</b>         |        | <b>3419</b> | <b>5.9</b>                  | <b>57630</b>             |

**TABLE 2.** Overall DMFT results for Scotland, incorporating the data from the fifteen Health Boards, appropriately weighted.

|  | Weighted mean | Range of means for individual Health Boards |
|--|---------------|---|
| age (in years)   | 14.24         | 14.20 - 14.56                               |
| decayed teeth (D)  | 0.59          | 0.14 - 0.68                                 |
| missing teeth (M)  | 0.38          | 0.09 - 0.53                                 |
| filled teeth (F)   | 2.59          | 1.73 - 3.59                                 |
| DFT (D+F)  | 3.18          | 2.14 - 4.22                                 |
| DMFT (D+M+F)   | 3.55          | 2.35 - 4.70                                 |
| sealants/sealant restorations  | 2.86          | 1.29 - 8.76                                 |
|  | <b>%</b>      | <b>Range for Health Boards</b>              |
| With zero caries DFT = 0 (as defined by Scottish CADOs, 1986: no caries experience of permanent teeth) | 24.2          | 14.8 - 35.4                                 |
| With " caries experience", DMFT > 0 (as per BASCD)   | 77.6          | 66.6 - 86.5                                 |
| With decay, D>0  | 27.5          | 10.5 - 33.5                                 |
| % of children with 1 or more sealants/sealants restorations  | 56.1          | 31.7 - 89.4                                 |



calibration for dental caries and fillings are contained in Appendix B, Table B1.

#### 4. DENTAL EXAMINATIONS

The examinations took place in November and December 1990. Table 1 shows the number of children examined in each Health Board. A total of 3419 children (5.9% of the Secondary III population) were examined. During the course of the examinations 10% of the sample were randomly selected for re-examination to assess the intra-dentist agreement (see Appendix B, Table B2).

#### 5. DATA PROCESSING

The design of the form used for recording the examinations allowed rapid computer entry of the data by keyboard operators. Data processing was undertaken by the Dental Health Services Research Unit who have also carried out the following analyses and produced this report.

#### 6. RESULTS

For ease of reference, the key results tables relating to dental caries are included in the text, whilst more detailed caries results are contained in Appendix C (all results relate to the permanent dentition only).

Results tables relating to oral cleanliness/periodontal status and to assessment of developmental defects of enamel, using the new SCOTS index, are contained in Appendices D and E respectively.

##### 6.1 Dental Caries Results for Scotland

Table 2 shows the overall results for Scotland in terms of decayed (D), missing (M) and filled (F) permanent teeth together with information on the presence of sealants/sealant restorations.

It should be appreciated that, in order to adhere to the BASCD guidelines and international conventions, figures for D only record dental decay (caries) at the "cavitation" level of diagnosis. This means that only dental caries that has progressed far enough to produce a definite hole (greater than 0.5 mm. diameter) in the tooth surface is recognised as caries, whilst teeth with all "earlier" forms of dental caries (smaller cavities and lesions in which there is no surface breakdown evident) are regarded as "sound" for the purpose of the survey.

Table 2 also gives three different ways of subdividing the sample by caries experience (at the cavitation level). Firstly, an overall value for so-called "zero caries" (no decay or filled teeth present, or DFT = 0) as this is a measure, defined by the Scottish CADOs, which is used by many Health Boards in the collection of local data. Secondly, the revised BASCD measure of "caries experience" (DMFT > 0) is given. (Please note that in 1988 results were given for DMFT = 0). This measure will allow comparisons with results to be published for the surveys of 14 year olds in England and Wales. Thirdly, the results are expressed as "with current decay" (D > 0; note that in 1988 results were given for D = 0). This measure ignores all evidence of past caries attack (filled and missing teeth) and considers only those teeth present and with decay at the cavitation level at the time of the examination.

##### 6.2 Dental Caries Experience by Health Board

Table 3 shows the dental caries results for each Health Board by listing the total caries experience (DMFT) as well as its constituent elements.

This information on DMFT values is shown in graphical form in Figure 1. The national UK survey conducted by the Office of Population Censuses and Surveys (OPCS) (Todd and Dodd, 1985) recorded the value of 6.8 for DMFT for Scottish 14 year olds in 1983. It can be seen that all Health Boards were substantially below this value in 1990.

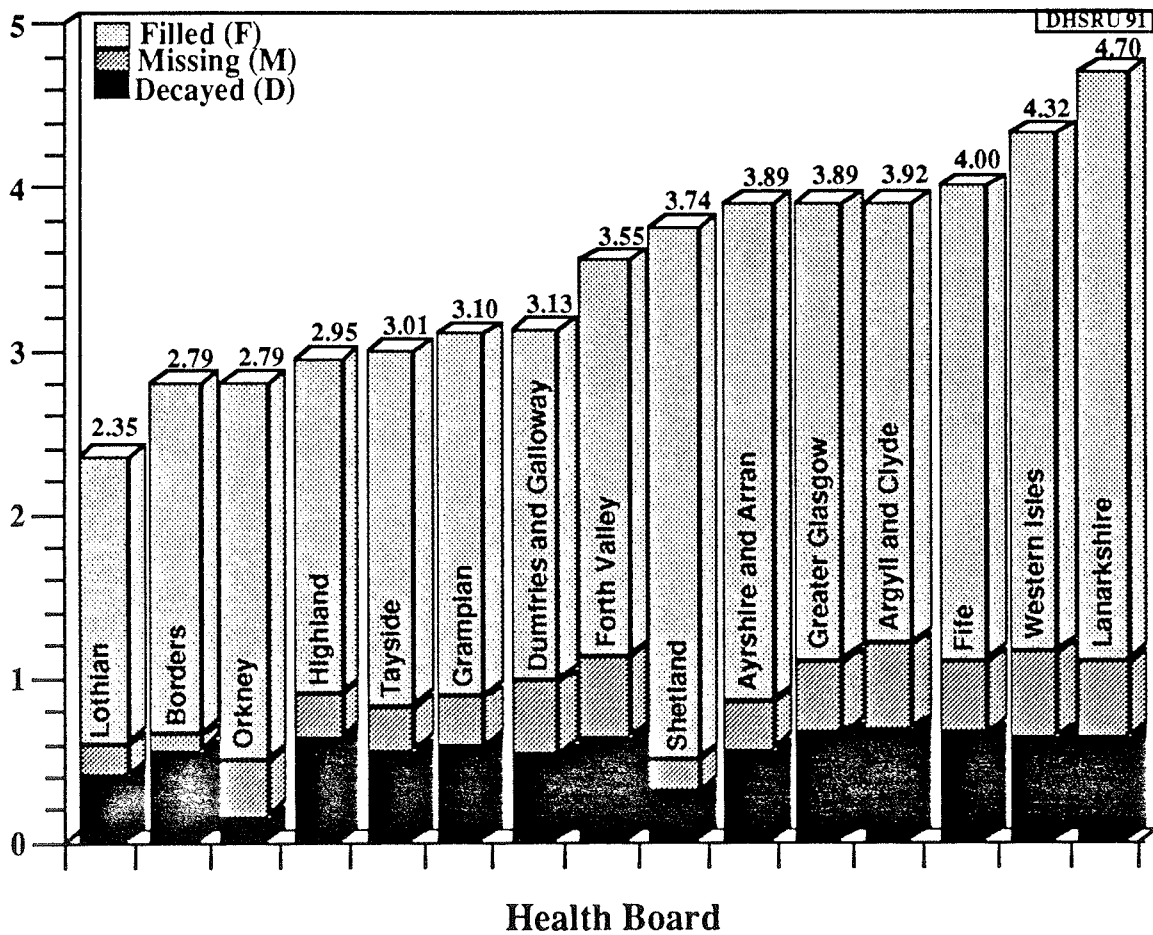
**TABLE 3.** Mean values per child for decayed\* (D), missing (M) and filled (F) teeth; percentages with "zero caries" (DFT=0) and "caries experience" (DMFT>0); mean number of sealed teeth per child and percentage with sealed teeth.

| Health Board          | D    | M    | F    | DFT  | DMFT | % DFT=0 | % DMFT>0 | SEALED | %SEALED>0 |
|-----------------------|------|------|------|------|------|---------|----------|--------|-----------|
| Argyll and Clyde      | 0.68 | 0.51 | 2.72 | 3.40 | 3.92 | 19.7    | 81.9     | 3.27   | 61.7      |
| Ayrshire and Arran    | 0.55 | 0.31 | 3.03 | 3.59 | 3.89 | 21.8    | 80.0     | 2.26   | 53.1      |
| Borders               | 0.55 | 0.09 | 2.15 | 2.70 | 2.79 | 30.6    | 69.4     | 1.74   | 47.7      |
| Dumfries and Galloway | 0.52 | 0.45 | 2.15 | 2.67 | 3.13 | 26.0    | 76.9     | 1.29   | 31.7      |
| Fife                  | 0.64 | 0.47 | 2.89 | 3.53 | 4.00 | 25.3    | 77.4     | 3.10   | 55.8      |
| Forth Valley          | 0.63 | 0.50 | 2.41 | 3.05 | 3.55 | 24.7    | 78.0     | 2.24   | 53.3      |
| Grampian              | 0.58 | 0.30 | 2.21 | 2.79 | 3.10 | 28.0    | 73.5     | 2.10   | 45.5      |
| Greater Glasgow       | 0.66 | 0.43 | 2.80 | 3.46 | 3.89 | 19.4    | 82.3     | 2.80   | 55.9      |
| Highland              | 0.62 | 0.27 | 2.07 | 2.69 | 2.95 | 35.4    | 66.2     | 3.65   | 66.2      |
| Lanarkshire           | 0.63 | 0.48 | 3.59 | 4.22 | 4.70 | 14.9    | 86.5     | 2.46   | 49.5      |
| Lothian               | 0.40 | 0.21 | 1.73 | 2.14 | 2.35 | 35.4    | 66.6     | 3.28   | 67.7      |
| Orkney                | 0.14 | 0.35 | 2.30 | 2.44 | 2.79 | 27.9    | 74.4     | 2.14   | 59.3      |
| Shetland              | 0.31 | 0.20 | 3.23 | 3.55 | 3.74 | 18.1    | 83.3     | 8.76   | 89.4      |
| Tayside               | 0.55 | 0.27 | 2.19 | 2.74 | 3.01 | 25.3    | 77.3     | 4.17   | 64.9      |
| Western Isles         | 0.62 | 0.53 | 3.17 | 3.79 | 4.32 | 14.8    | 85.2     | 3.03   | 44.3      |

\* "decay" means caries at the cavitation level of diagnosis.

D = codes 1,2,3,4; F = codes F,R,N; S = codes S,N,Q

**FIGURE 1. Mean number of Decayed, Missing and Filled teeth per child for each Health Board**



### 6.3 The Proportion "With Caries Experience" in each Health Board.

Figure 2 illustrates the "with caries experience" (DMFT>0) results for each Health Board. (Note that Figure 2 of the 1988 report gave percentages with *no* caries experience, DMFT = 0). The overall value of 77.6% "with caries experience" (Table 2) shows substantial improvement on the Scottish situation in 1983, as assessed by the OPCS survey, when the recorded figure for 14 year old children was 95%.

### 6.4 Site and Surface Results

The results broken down to the tooth "surface" as a unit of measurement (rather than the "tooth") are presented in Appendix C. Table C1 shows, for each Health Board, the mean values per child for decayed surfaces (DS), filled surfaces (FS) and decayed and filled surfaces (DFS). Figure C2 demonstrates graphically the distribution of caries experience across the different individual teeth while Figure C3 shows the distribution according to the different types of tooth surface.

### 6.5 Sealants/Sealant Restorations

The presence of sealants and sealant restorations was investigated for teeth not classified as decayed and not containing a conventional filling (amalgam or "tooth-coloured" material). The count of teeth protected from caries attack by the presence of fissure sealant thus includes teeth with an obvious sealant restoration (which have also been included in the "filled" component of the DMFT index).

Overall figures (Table 2) indicate that 56.1% of 14 year olds in Scotland have now received treatment involving fissure sealant. There is a marked variation (Table 3 and Figure 3) in regional provision. Table C1 gives the sealant/sealant restoration results by surface (SS) as well as by tooth.

### 6.6 Oral Cleanliness and Periodontal Condition

Oral cleanliness was measured by recording the presence or absence of plaque on specific surfaces of six index teeth (UR6, UR1, UL6, LR6, LL1, LL6). The periodontal condition of the mouth was recorded using the version of CPITN developed for adolescents, the method recommended for use in WHO surveys (Ainamo et al, 1984). The same six index teeth were used as for oral cleanliness. Results are shown in tables D1 and D2 in Appendix D.

### 6.7 Developmental Defects of Enamel

The presence and extent of developmental anomalies or defects in the enamel of the upper four permanent incisor teeth was assessed using the newly proposed SCOTS index (see Appendix E).

According to this index, 78.8% of children had neither opacities nor hypoplasia that were detectable when the teeth were examined wet (Table E2). Demarcated opacities were the most frequently encountered anomaly (13.4% of all children) followed by diffuse opacities (9.3%) while hypoplasias were less common (2.2%) (Table E1). Of the children affected, only 25% of boys and 34% of girls were aware of marks on the upper teeth that were developmental in origin.

## 7. DISCUSSION

### 7.1 Dental Caries Results for Scotland

The results show a considerable improvement over the years since the last UK national survey carried out in 1983 by OPCS (Todd and Dodd, 1985). For 14 year old children the mean value for decayed, missing and filled teeth has nearly halved during the seven year period 1983-1990 (6.8 down to 3.6) whilst the proportion of children "with caries experience" has decreased from 95% to 78%. But, to put these results in context,

FIGURE 2. Percentage with cavities or past caries experience in each Health Board

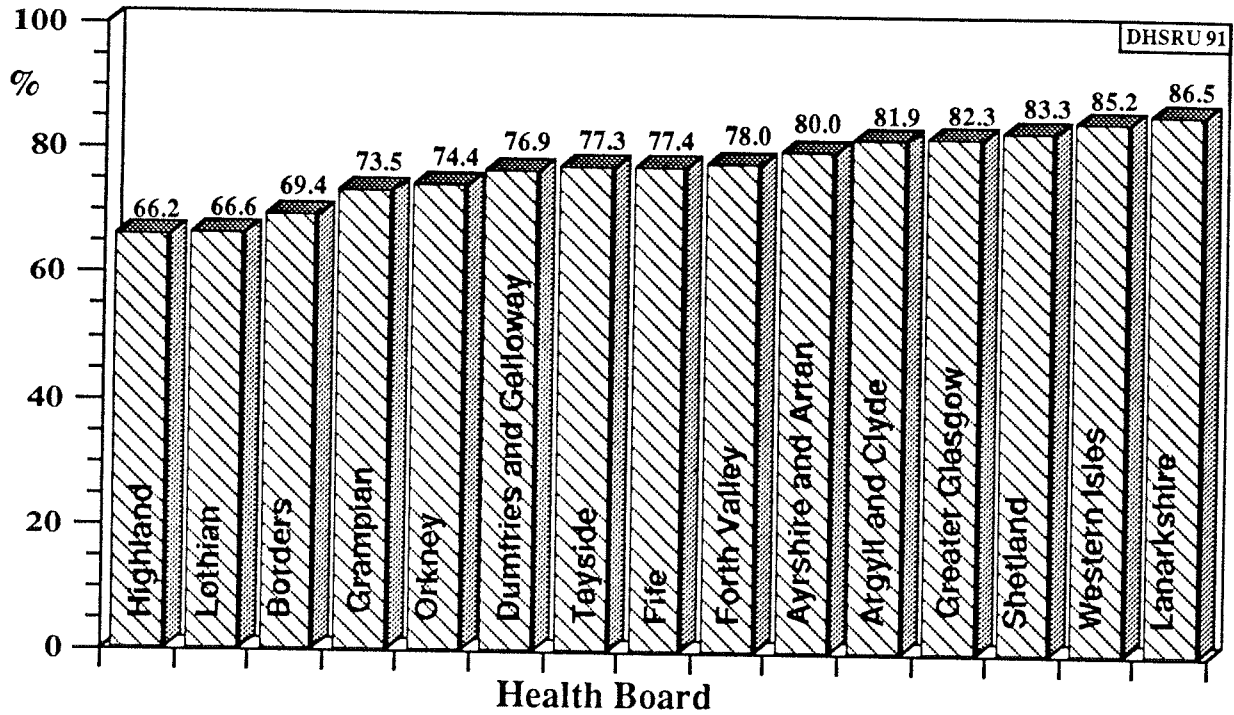


FIGURE 3. Percentage with one or more sealed teeth (sealants and sealant restorations) in each Health Board

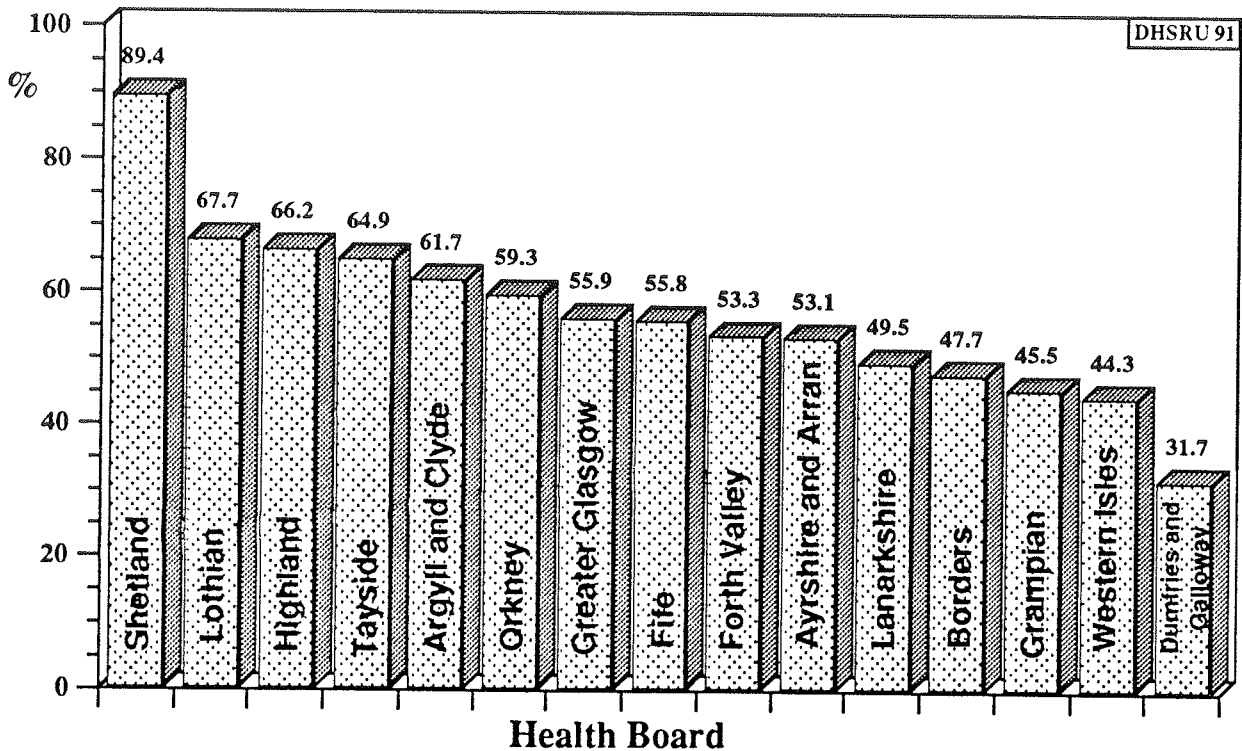
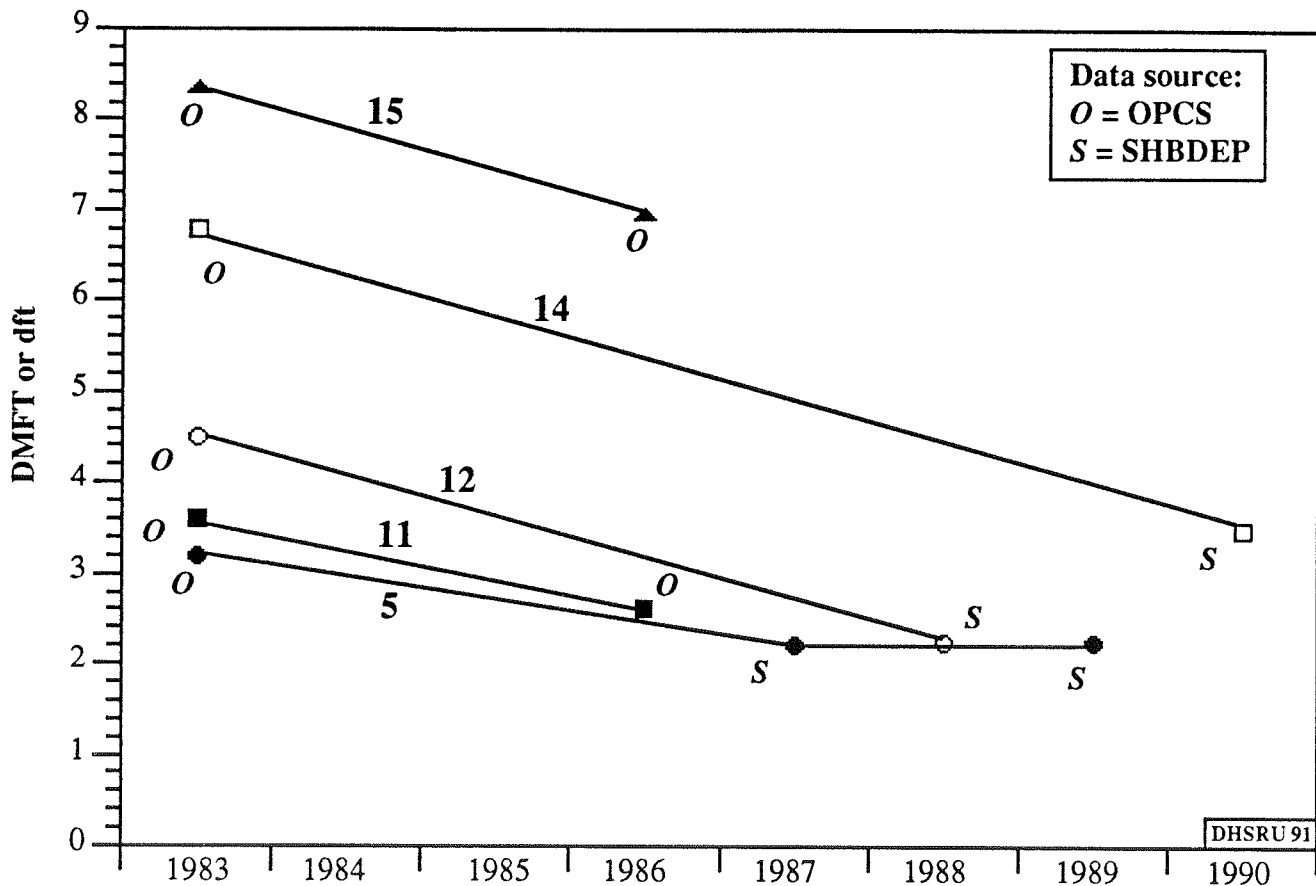


FIGURE 4. Trends in mean caries scores for Scottish children aged 5, 11, 12, 14 and 15 years.



six of the seven English regions for whom figures are available had, by 1986, already achieved DMFT values below 3.5 (Dowell and Evans, 1988).

An alternative way of looking at the results is to consider the change in dental health status for the same children over the two years from age 12 in 1988 to age 14 in 1990. The mean DMFT has increased from 2.2 to 3.5, an average of more than one extra decayed, missing or filled tooth for every 14 year old in Scotland. The proportion "with caries experience" increased from 68% to 77%, leaving less than a quarter of 14 year olds unaffected by dental decay. These changes over

time are illustrated for five different age groups of Scottish children in Figure 4, using data from the OPCS UK national survey of 1983 (Todd and Dodd, 1985), from the OPCS survey of Scottish children's dental health in 1986 (Todd, 1988) and from the four surveys so far conducted in this programme.

### 7.2 Dental Caries Experience by Health Board

As in previous years, there is a wide variation in caries experience between the Health Boards (Figure 1). The range of mean values for DMFT for 12 year olds in 1988 was 1.34 to 3.13. At age

14, this has widened to 2.35 to 4.70, with 14 of the 15 Health Boards showing an increase in excess of one DMFT over the two years. Although there are statistically significant differences between Health Boards at the extreme ends of the figure, it should be appreciated that the degree of precision associated with the mean values is such that this should not be interpreted as a definitive "league table".

### *7.3 The Proportion "With Caries Experience" in each Health Board*

The values for the proportion "with caries experience" ranges from 67% to 87% across the Health Boards, compared with a range of 53% to 79% for 12 year olds in 1988. A different way of looking at these figures is to say that, in the Health Board with the lowest proportion "with caries experience", one 14 year old in three has avoided dental decay, whilst for the Health Boards at the other end of the spectrum only one in seven is in this position. These results are comparable with those achieved in England in 1986 (Dowell and Evans, 1988), showing that, as has long been the case, Scotland lags several years behind England in the achievement of improved levels of dental health. Results for England and Wales for 14 year olds in 1990/91 will be published, when available next year, in *Community Dental Health*, allowing a direct comparison of the different parts of the United Kingdom.

### *7.4 Sites and Surfaces*

The DFS (surface) values in Table C1, when compared with the corresponding DFT (tooth) values (Table 3) and with the results from 1988, show that not only is the DFS value higher per se than for 12 year olds in 1988, but an increased number of surfaces per affected tooth are now decayed or filled. Thus these 14 year olds are already locked into a pattern of increasing loss of tooth tissue for the individual teeth under attack. The pattern of attack on individual teeth is illustrated in Figure C2. Three-quarters of present and past caries experience is recorded in the first and

second permanent molars (the "6s" and "7s"). The lower percentage recorded for the second permanent molars (18%) compared with the first permanent molars (58%) is a reflection on the shorter exposure time in the mouth (second permanent molars erupt at around age 12, first permanent molars at age 6).

### *7.5 Sealants/Sealant Restorations*

Since the first recording of the provision of fissure sealants in the OPCS survey of 1983, there has been a steady increase in the use of this technique. 12% of Scottish 14 year olds had some sealants in 1983. In 1986 a figure of 18% of 15 year olds was recorded (no figures are available for 14 year olds in 1986). This survey shows that 56% of Scottish 14 year olds now have at least one tooth protected from caries by this procedure. If one removes the children with no sealants from the calculation of the number of sealants placed, then the average number for those who *do* receive sealants is 5.2, reflecting a policy of sealing all unrestored permanent molars (and sometimes pre-molars) rather than protecting individual teeth.

### *7.6 Oral Cleanliness and Periodontal Condition*

Considerable variation across Health Boards was recorded, with mean plaque score values (0 = minimum, 1 = maximum) ranging from 0.14 to 0.42 (Table D1). The mean number of 6 index teeth with a CPITN score of zero ranged from 3.62 to 5.58 (Table D2). It must be noted that some of the variation may be attributable to inter-examiner variability. Within the sensitivity of the measures employed, there is no evidence of any deterioration in levels of oral cleanliness and periodontal condition between the ages of 12 and 14 years.

### *7.7 Assessment of Developmental Defects of Enamel*

The new SCOTS index met with a favourable reception from the examiners (in contrast to the

previously attempted orthodontic assessment). The level of reproducibility achieved at the calibration course was promising but should be improved if possible.

The SCOTS results provide a national baseline for the prevalence of developmental defects of enamel, when assessed at a public health level. The results suggest that whilst these sorts of anomalies may affect 21% of 14 year olds, the majority of affected children are unaware of them (see Appendix E).

## 8. SUMMARY

The first cycle of four annual examinations (of those aged 5, 12, 5, and 14) is now complete. In the four years to date of the Scottish Health Boards' Dental Epidemiological Programme over 15,000 children have been examined by trained and calibrated examiners from the fifteen Health Boards, employing a standardised system of diagnosis and recording.

Results for the 1989 surveys in England and Wales are now available and a comparison of dental health of 5 year olds throughout the United Kingdom is shown in map form in Appendix H.

In Scotland, this latest survey of 14 year olds confirms the fall in caries prevalence rates during the 1980s seen for the other age groups surveyed in the programme (Figure 4). A fall from 6.8 decayed, missing and filled teeth in 1983 to 3.6 in 1990 must be seen as substantial progress towards the elimination of this preventable disease. However, the knowledge that less than one quarter of Scottish 14 year olds have avoided dental decay, as measured using the survey criteria, demonstrates that much still has to be done to improve the situation.

The increase in the provision of sealants reflects efforts to provide preventive dental care and it is hoped that this will be maintained under the new contractual arrangements which have recently come into force in the General Dental Service.

The results of the oral cleanliness/periodontal condition assessments show little change from the results obtained two years previously. The use of the SCOTS index provides baseline data on the prevalence of developmental defects of enamel, which should be invaluable in the years to come.

The four surveys undertaken to date allow a more complete picture of patterns of dental disease in Scotland than has hitherto been available. Results from the second series of surveys, which will commence in November 1991, will provide further information on recent trends in dental health. It is hoped that these surveys are proving to be of value in the planning and evaluation of dental health services in Scotland.

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