**Dental caries in Danish children: 1988-2001**

S. POULSEN*, M. MALLING PEDERSEN**

**ABSTRACT.** **Aim** To report national data on dental caries in Danish children and adolescents from 1988 to 2001. **Study design** Descriptive cross-sectional epidemiological study. **Methods** Data on dental caries for 5, 7, 12 and 15 year old individuals reported from 1988 to 2001 to the database established by the Danish National Board of Health. **Results** Caries has decreased in all four age groups, but the decrease levelled out by the end of the period. The relative decrease is less in the primary dentition than in the permanent dentition. The shift to the left of the distribution of 15 year olds according to DMFS is marked, while the distribution of 5 year old children according to dmfs is almost unchanged. Mean number of non-cavitated lesions is slightly more than one, but the distribution is very skewed. A 50% decrease in mean DMFS for 15 year old children was found for most of the counties. **Conclusion** Caries has decreased in Danish children and adolescents from 1988 to 2001. In relative terms, the decrease is less in the primary dentition than in the permanent dentition. The decrease seems to have taken place across the entire country.

**KEYWORDS:** Caries, Danish children

**Introduction**

Since 1972, legislation in Denmark has placed the responsibility for organisation of oral health care services for children and adolescents with the municipalities of which there are 275 in the country. Concomitantly with the implementation of the service, the Danish National Board of Health established a reporting system and a database in order to monitor oral health in children and adolescents [Helm, 1973]. The reporting system has annually made data available to the central administrative level since 1972, but has also proved to be a valuable tool for planning and evaluation at the local, municipal level [Hansen et al., 2002]. The oral health care service for children in Denmark has a high level of acceptance in the population and more than 95% of the target population of children and adolescents from birth until the age of 18 years attend the service.

Data on national statistics have been published internationally [Helm, 1973b; Schwartz and Hansen, 1979; Schwartz et al., 1994; Poulsen, 1996; Poulsen and Scheutz, 1999; Poulsen et al., 2001] and have also been placed in the WHO Oral Health Country/Area Profile Program [WHO, 2002], in order to allow for international comparisons. The purpose of the present publication is to report national data on dental caries in Danish children and adolescents from 1988 to 2001.

**Material and methods**

Data on dental caries, periodontal conditions and malocclusion traits are collected at each child’s visit to the dental clinic using a specially designed recording form for optical character recognition. Minor changes have been made in the type of information recorded and in the design of the form. In the following text only data on caries will be reported. Since the implementation of the system and up to and including 1992, reporting of all children was compulsory. From the beginning of 1993 compulsory reporting only included 5, 7, 12 and 15 year old individuals, and for that reason only data for these age groups will be reported.
Written criteria for caries diagnosis are available from a guideline produced by the Danish National Board of Health. Diagnoses of primary as well as permanent tooth surfaces include the following: non-cavitated lesions, decay (primary as well as secondary), filling, and loss due to caries. The guidelines include no specifications as to the use of radiographs. The number of children that were reported to the database varied from approximately 30,000 to 60,000 (Table 1), indicating the high coverage of the system.

### Results

Both Table 2 and Table 3 show that mean caries index has decreased in all four age groups from 1988 to 2001, but for all age groups the decrease levels out by the end of the period. As an example, DMFS for 15 year olds decreased from 2.20 surfaces during the first three years of the period compared with only 0.35 surfaces during the last three years. Another important finding is that the decrease in mean caries index in the primary dentition is less than the decrease in the permanent dentition. As an example, dmfs for 5 year old children decreased by 36% from 1988 to 2001, while DMFS for 7, 12 and 15 year old children decreased by 63%, 60% and 52% respectively.

The distribution of 5 year old children according to dmfs (Fig. 1) shows a slight shift to the left from 1988 to 2001 with an increase of 5 year old children with a dmfs of 0 from 62% to 71%. In contrast, the distribution of 15 year olds according to DMFS (Fig. 2) shows a marked shift to the left with an increase in 15 year olds with a DMFS of 0 from 12% to 35%.

In Figure 1 and Figure 2 non-cavitated lesions were not included in the caries index. The effect of the

### Table 1 - Number of 5, 7, 12 and 15 year old Danish children reported to the national database 1988 to 2001.

<table>
<thead>
<tr>
<th>Year</th>
<th>5 yr</th>
<th>7 yr</th>
<th>12 yr</th>
<th>15 yr</th>
</tr>
</thead>
<tbody>
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<td>43,145</td>
<td>58,710</td>
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<td>48,963</td>
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<tr>
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</tr>
<tr>
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<td>48,963</td>
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<td>1996</td>
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<td>49,989</td>
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<tr>
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<td>64,568</td>
<td>57,503</td>
<td>50,478</td>
</tr>
<tr>
<td>2001</td>
<td>60,709</td>
<td>64,568</td>
<td>57,503</td>
<td>50,478</td>
</tr>
</tbody>
</table>

### Table 2 - Mean dmft for 5 year olds and mean DMFT for 7, 12 and 15 year old Danish children 1988 to 2001.

<table>
<thead>
<tr>
<th>Year</th>
<th>5 yr</th>
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<th>12 yr</th>
<th>15 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
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<td>0.41</td>
<td>3.02</td>
<td>6.68</td>
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<tr>
<td>1989</td>
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<td>1.93</td>
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<td>1.83</td>
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<td>0.18</td>
<td>1.85</td>
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<tr>
<td>1993</td>
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<td>1998</td>
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<td>1.49</td>
<td>3.59</td>
</tr>
<tr>
<td>1999</td>
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<td>0.14</td>
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<tr>
<td>2000</td>
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<td>0.13</td>
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<td>3.34</td>
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<tr>
<td>2001</td>
<td>1.59</td>
<td>0.15</td>
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<td>3.24</td>
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</tbody>
</table>

### Table 3 - Mean dmfs for 5 year olds and mean DMFS for 7, 12 and 15 year old Danish children 1988 to 2001.

<table>
<thead>
<tr>
<th>Year</th>
<th>5 yr</th>
<th>7 yr</th>
<th>12 yr</th>
<th>15 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>1.49</td>
<td>0.33</td>
<td>2.18</td>
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</tr>
<tr>
<td>1989</td>
<td>1.28</td>
<td>0.17</td>
<td>1.63</td>
<td>3.51</td>
</tr>
<tr>
<td>1990</td>
<td>1.38</td>
<td>0.15</td>
<td>1.41</td>
<td>3.25</td>
</tr>
<tr>
<td>1991</td>
<td>1.39</td>
<td>0.16</td>
<td>1.34</td>
<td>3.15</td>
</tr>
<tr>
<td>1992</td>
<td>1.46</td>
<td>0.15</td>
<td>1.32</td>
<td>3.07</td>
</tr>
<tr>
<td>1993</td>
<td>1.38</td>
<td>0.14</td>
<td>1.39</td>
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<tr>
<td>1994</td>
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<td>0.13</td>
<td>1.33</td>
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</tr>
<tr>
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<td>1996</td>
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<tr>
<td>1997</td>
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<td>0.10</td>
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<tr>
<td>1998</td>
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<td>0.11</td>
<td>1.07</td>
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<tr>
<td>1999</td>
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<tr>
<td>2000</td>
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<td>0.98</td>
<td>2.29</td>
</tr>
<tr>
<td>2001</td>
<td>1.00</td>
<td>0.12</td>
<td>0.89</td>
<td>2.23</td>
</tr>
</tbody>
</table>
The choice of diagnostic cut-off point on the caries index is illustrated in Figure 3, where the number of initial lesions is shown together with the other components of the caries index for 15 year olds 1988-2001. The mean number of non-cavitated lesions is slightly more than one and almost constant over the period. Figure 4 shows that non-cavitated lesions also have a skewed distribution in this population.

In order to study the geographical variation in caries from 1988 to 2001, data from the municipalities were aggregated at the county level. Denmark has 14 counties, each consisting of a number of municipalities. Furthermore, the municipalities of Copenhagen and Frederiksborg (a large urban municipality just outside Copenhagen) also have status as counties. Figure 5
shows the considerable geographical variation in mean DMFS between the 16 administrative units both in 1988 (range: 4.79 to 10.41) and in 2002 (range: 1.37 to 4.85). It is interesting to note that all counties in 1988 had a DMFS for 15 year olds of 4.79 or more, while in 2001 all counties had a DMFS for 15 year olds of 4.85 or less. Figure 5 also shows that all counties have experienced a decrease in mean DMFS for 15 year olds of approximately 50%.

Discussion
The present report is in agreement with a number of previous ones from other western countries, that demonstrate a decrease in caries during the last decades, but also that the decrease seems to have leveled out.

One interesting finding in the present study is that caries in the primary dentition of 5 year old children seems to be under less control than caries in the permanent dentition of older children. One reason for this could be differences in dietary habits and oral hygiene practices during preschool and school age children.

Another explanation may be that the prevailing caries preventive methods for school children (for example fluorides, fissure sealing, and supervised toothbrushing) are more effective than those for preschool children, where tooth brushing and changes of dietary habits may be difficult to implement. As restorative care in preschool children is difficult to perform and may result in pain, distress and a subsequent risk of dental fear and anxiety [Raadal et al., 2002], every effort should be made to prevent dental caries in the primary dentition.

Data for the present study were collected as part of the routine procedures in the municipal dental clinics by a large number of examiners (900 to 1,000). Thus, calibration has not been feasible, and the interpretation of the written criteria issued by the Danish National Board of Health is left to the individual examiner. In some cases, however, this is after calibration with other colleagues within their municipality. It is generally believed that the information recorded and submitted to the database is a combination of the written criteria and the examiners’ interpretation of need for non-operative or operative treatment. This has important consequences for the interpretation of our results.

First of all, the lower level of non-cavitated lesions as compared with the findings by Amarante et al. [1998], may be explained by the routine character of the examination, as compared with the examination methods employed when collecting data on occurrence of caries using “pure” epidemiological diagnostic criteria.

Secondly, it has been shown that treatment strategies have changed considerably towards a more conservative approach, resulting in later restorative intervention [Heidmann et al., 1988]. The decrease in dental caries found in the present study may thus reflect a decrease in the occurrence of the disease as well as a change towards more non-operative caries treatment.

References


WHO 2002 http://www.whocollab.od.mah.se/index.html