Caries Research

Caries Res 2004;38:173–181
DOI: 10.1159/000077752

Changes in Dental Caries 1953–2003

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Key Words
Dental caries · Caries epidemiology · Time trends

Abstract
In the first half of the 20th century, indices and methods of conducting surveys of the level of dental diseases were developed. Modern epidemiological studies began in the fifties and many reliable studies have been conducted after 1960. In the following decades, a substantial decline of caries prevalence was documented in the majority of the highly industrialized countries, with reductions of lifetime caries experience exceeding 75%. The decline comes to an end when low or very low levels of prevalence are reached. Children of low socioeconomic status and immigrants from outside Western Europe, however, generally have higher disease levels and may cause increases in caries prevalence. For this and other reasons, caries epidemiology will remain an indispensable part of dental public health.

Early Phases and Progress in Sampling Theory

It was around 1900 that the first statistics on dental decay were published, which was approximately the time when the first university dental institutes were training students in dentistry. The number of these early statistics was very low and they are difficult to interpret. Half a century later, a special commission of the International Dental Association prepared a survey covering the period 1950–1963, which showed that numerous epidemiological studies were carried out at that time. From the 14 most active countries in Europe, a total of 420 publications were compiled [FDI, 1964]. Increasingly, DMFT counts were used. There were two main purposes: (1) purely epidemiological, i.e. to assess the dental status, and (2) identification of the caries-inhibiting effect of fluoride in the drinking water with levels either below 0.3 or above 0.8 ppm.

Up to the sixties, the tendency was to draw samples in towns or cities close to dental schools or in areas where special circumstances were expected. Usually it was not specified how the samples were drawn; nowadays they would be regarded as 'convenience' samples. In fact, papers on concepts and theory of random sampling began to appear in the 1930s only in specialized statistical journals. It was only in 1949 that the first textbook on this new topic appeared [Yates, 1949]. Its focus was on agricultural research in England. The second textbook, by Cochran

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Table 1. Percentages of children examined from the total of the children selected at random in each of the 16 communities

	No examination of teeth at all	Exam yes, but no radiographs	Total non-response
1964	0	<1	<1
1968	0	<1	<1
1972	0	<1	<1
1976	0	<2	<2
New law on protection from radiation			
1980	<2	no records	no records
1984	<3	14	<17
Accident at the Chernobyl atomic reactor in 1986			
1988	6*	32	36
1992	8*	35	40
Radiation exposure reduced from 0.34 to 0.12 s			
1996	10*	25	32
2000	11*	19	28

* Based on detailed records obtained in 1988; approximately one third were in fact outright rejections, others not examined were sick at the examination day(s), wore extensive orthodontic appliances or had moved. The percentages of children not examined because of rejection were accordingly 4–6 % points lower than the figures presented for 1988 through 2000.

[1953], was relatively easy to understand and was widely used.

The earliest caries studies based on random sampling were those carried out in the USA: 1960–62 in adults, 1963–65 in children and 1966–70 in 12- to 17-year-old youths [National Center for Health Statistics, 1967, 1971, 1974]. Similar studies based on random selection procedures were conducted in 1968 with adults in England and Wales [Gray et al., 1970] and in 1973 with children [Todd, 1975]. It took another 20 years until other highly industrialized countries had carried out comparable surveys. This was in part due to three circumstances:

(1) The theory and practice of drawing samples were relatively new.

(2) In general, it was – and may be even today – difficult to obtain true random samples, i. e. samples in which each individual of a nation or a province etc. envisaged has the same probability of being included in the sample.

(3) Once the sample has been selected at random from available lists, each individual chosen should be examined. In the last decades, this prerequisite has become increasingly difficult to fulfill as illustrated in the following paragraph.

The surveys repeated every 4 years in the Canton of Zurich were carried out within the school dental services. The services have for decades included one mandatory clinical examination of every schoolchild per year, and the examinations for statistical/epidemiological purposes were declared as part of the school dental service (specifically serving quality control of treatments and prevention). Up to 1976, rejection rates were below 2%, but as shown in table 1, rejection rates increased after a new law on radiation protection and even more so after the accident in the Chernobyl atomic reactor. The highest rejection rate was 40% in 1992. As of 2000, the overall rejection rate was down to 28%, with 19% rejecting exclusively the radiographic examination. In very recent times, some adolescents just object to sit down on the examination chair, with teacher and parents often commenting that 'this is their personal freedom'. In such situations, attempts to obtain random samples may in fact be futile due to the fact that often more than half of the selected subjects cannot be examined. In a recent study in the USA, parents had at first to be asked whether they were interested in a survey including the examination of the teeth and an assessment of urinary fluoride excretion. Those who did hand in the signed one-page document were then given a two-page detailed information sheet in which at the end they were asked to sign a text like 'with my signature I decide that my child is allowed to take part in...'.

The Early Years of the Decline in Western Europe

The surveys published up to the sixties suggested that dental caries prevalence was high in children of Western European countries. Children 12 years of age often had on average more than 5 DMFT, and at the age of 15 the DMFT averages were often above 10. In the countries with comprehensive school dental services, high caries prevalence was of course known from the excessive burden of restorative treatment and the frequent destruction of teeth beyond repair.

This deplorable situation was often the starting point for the search for preventive measures. The discovery of the cariostatic effects of fluoride rapidly inspired many activities in both research and practical dentistry. A considerable number of projects were begun around 1960. Local uses of fluorides were preferred in the Scandinavian studies while in other Western European countries the majority of projects attempted to assess the caries-pre-

ventive potential of daily tablet intake. Many of these projects were done by school dental services in cooperation with dental schools, which provided professional advice and often carried out the examination of the children's teeth and the statistical evaluations.

Many of the early Scandinavian reports of a caries decline were cited by von der Fehr [1994] and von der Fehr and Haugejorden [1997]. The latter paper showed that in 5 of the 14 Norwegian counties, the decline began around 1967. The authors concluded that in Norway the decline started when fluoride brushing or rinsing programs were introduced. Widespread use of fluoride toothpastes could become a factor at the earliest in 1971/72, that is 4 years later.

According to a Danish report typical of that period, a reduction of caries increments of slightly above 50% was obtained from 1962 to 1966 through a comprehensive school-based program comprising multiple topical fluorides [Kann, 1968]. In Switzerland, decline of caries became obvious in the early sixties [Wegelin, 1964; Marthaler and König, 1967; Marthaler, 1969]. Rieder [1967] reported a rapidly decreasing number of fillings necessary in the school dental service. In the Canton of Zurich, the onset of a caries decline was documented already for the period 1964–1968 [Marthaler, 1972]. Early reports on a decline appeared also in Germany [e.g. Sigrist and Marthaler, 1975] and Austria, but there were no conferences or review papers summarizing them.

The Declines of Caries Prevalence in Selected Western European Countries

On the occasion of the 25th Anniversary of ORCA in 1978, this organization published a supplement to *Caries Research* with the title *Progress in Caries Prevention* [Ericsson, 1978]. In the preface, Yngve Ericsson ventured to state that 'In no other period of history, outside the times of enforced rationing and shortages in war and famine, have these countries enjoyed so great an improvement of dental health'; these countries were those 'where preventive methods have been systematically implemented on a large scale' [Ericsson, 1978]. In 1985, a Commission of the FDI compiled data demonstrating a caries decline in 9 countries [Renson et al., 1985]. Four of them were the Northern European countries Denmark, Finland, Norway and Sweden. The remaining 5 were Australia, the Netherlands, New Zealand, the United Kingdom and the USA. After publication of this report, it became widely acknowledged that a secular decline was going on in many industrialized countries. The greatly improved dental health up to 1993 was further documented at the 'Second International Conference of Declining Caries', held in London in April 1994 [Naylor, 1994].

The decline took various courses in Western Europe. This may be exemplified by using data from the Netherlands and Switzerland. The decrease in the Netherlands, as studied in 12-year-old children, was summarized in a very simple manner: 'The average DMFT decreased steadily from 8 in 1965 to one in 1993' [König, 2002]. Figure 1 illustrates that in fact the decrease tended to be linear (the customary regression line was not calculated as the beginning and the end of the decline cannot be determined; in addition, the data came from different towns and cities and were based on variable numbers [Truin et al., 1994]; the line drawn is sufficient for the illustration intended here). A decrease of 7 DMFT in 28 years is equivalent to a decrease of 0.25 DMFT per year.

The decrease of the DMFT averages in the Canton of Zurich took a different course. As is evident from figure 2, the reduction was most rapid in the mid-sixties but became gradually smaller in numerical terms. Accordingly, the logarithms of the DMFT averages closely followed a straight line for all of the four age groups studied (8-, 10-, 12- and 14-year-olds) [Marthaler et al., 1994]. The course of the decline of the DMFT averages was obviously different from the one in the Netherlands.

Most of the European data on the decline up to 1993 were presented at the 'Second International Conference on Declining Caries' [Naylor, 1994]. At the ORCA Symposium of 1995, the decline of the DMFT in several Western European countries was found to be still continuing until 1994 [Marthaler et al., 1996]. In the case of Eastern Germany, a large dataset was available over a period of up to 30 years. The data available until 1995, extensively reviewed by Künzel [1997], documented that a decline occurred between 1985 and 1995, obviously connected with the 'Westernization' of former Eastern Germany (the former German Democratic Republic). The earlier statistics, dating back to 1959, showed that the fluoride level in the drinking water had been the main determinant of dental caries prevalence.

In recent years, an increasing number of papers has shown that caries prevalence was highest in the lower socioeconomic strata. Bratthall's [2000] significant caries index (SiC) is a reliable tool for focusing on children with high caries experience. The SiC is the average DMFT in the one third of children with the highest caries experience; accordingly, the SiC does not depend on assessments of socioeconomic status (SES), the definition of

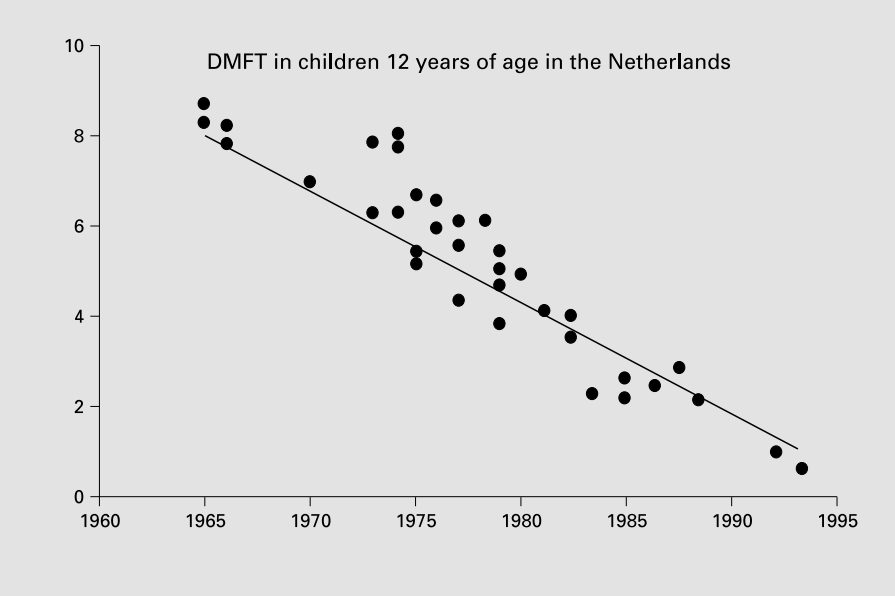

Fig. 1. Average DMFT of 12-year-old children in various towns and cities of the Netherlands [data points from Truin, 1997]. The line symbolizes the steady fall of the averages, equal to approximately 0.25 less DMFT per year from 1965 (8 DMFT) to 1993 (1 DMFT).

which varies from one country to another. In the Swiss Canton of Zurich, the average DMFT of all 12-year-old children examined in 1964 was 7.9 while their SiC was 13.1. In 1996, presumably the end of the period of decline regarding the age group 12, the averages were 0.84 and 2.38, respectively [unpublished data drawn from the existing datasets of the Canton of Zurich, which is the database for the paper by Menghini et al., 2003b]. The reduction of the SiC by 82%, from 13.1 to 2.38, was a dramatic improvement for the one third of children with the highest caries risk. The children of the lowest tercile had an average DMFT = 0, since 62% of the examined children were caries-free.

Reasons for the Decline

Different or sometimes widely diverging opinions exist regarding the reasons of the decline. An inquiry including 52 selected experts, carried out in the mid-nineties, revealed that the daily use of fluoridated toothpastes, preferably twice a day, was considered to be the most important single factor by most experts [Bratthall et al., 1996]. In controlled randomized studies comparing dentifrices with and without fluoride, the reductions ascribable to fluoride were often between 20 and 40% and rarely exceeded 50%. If we assume that 6.0 DMFT were the approximate DMFT in 12-year-old children prior to the decline, fluoride in dentifrices would have lowered the

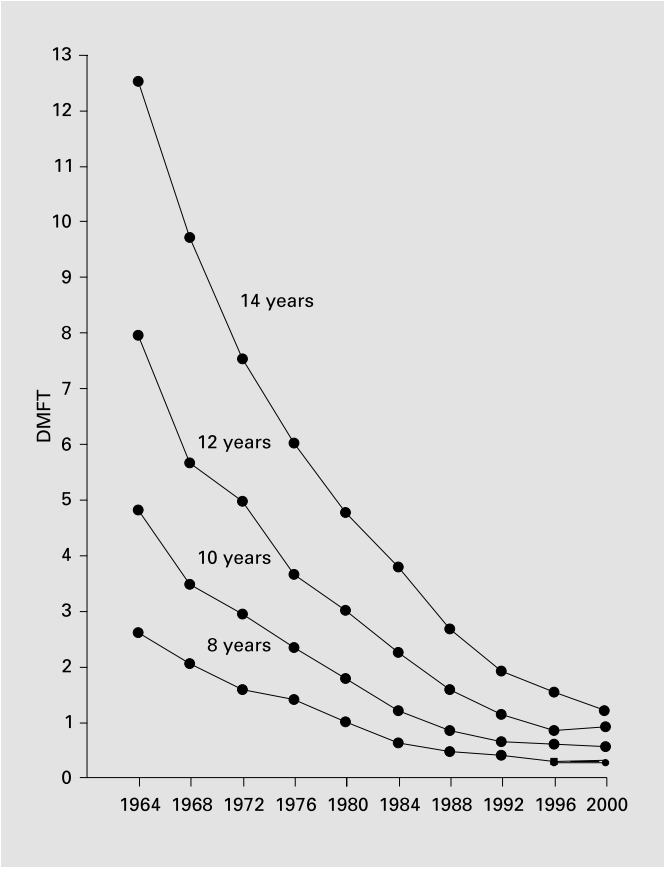

Fig. 2. Average DMFT in children (permanent residents) in 16 communities of the Canton of Zurich in which surveys were conducted every 4 years since 1964.

DMFT to 3.0. In several countries, however, the DMFT averages have fallen to 1.0 or even below. What are the reasons for the reduction from 3 to 1.0 DMFT, equivalent to 67%? In part, it may be due to improved toothbrushing habits: more frequent and more thorough toothbrushing would strengthen the fluoride effect, lower the 'aggressivity' of dental plaque and remove fermentable food remnants more thoroughly. However, other important factors are likely to be involved in the dramatic decline of dental caries prevalence at school age. Unfortunately, analytical epidemiological studies often do not provide useful or reliable data to support or disprove specific hypotheses. Therefore, the role of other favorable factors is still a matter of discussion [Bratthall et al., 1996].

Among the factors considered unimportant by Bratthall et al. [1996], placement of sealants needs to be reconsidered. In case of DMFT averages above 3, there will be much caries apart from fissures and pits and the role of sealants will be limited (except perhaps in projects in which they were applied on all fissures and pits of first molars). There is also the irrefutable fact that declines above 70% were obtained in several Western European countries before fissure sealants were commonly used, that is before 1985–1990. However, in the countries in which DMFT averages are now below 2.0, most of the caries occurs in fissures and pits of the first molars until the age of 12 years. Consequently, there are reasons to assume that sealants can be a very important, or even the main factor in lowering the DMFT from say 1.5 to 1.0.

Finally, there is agreement that the various and continued uses of fluorides, often applied in combination, are by far the most important factors of the decline. Some confusion has arisen from the fact that in a few specific situations, water fluoridated to around 1 ppm has lost part of its effectiveness of reducing DMFT experience by 50–60%, as documented up to 1980. In modern societies using fluorides in toothpastes and other topical applications, water fluoridation cannot be clearly demonstrated.

Observations regarding the End of the Decline

Regarding the primary dentition, Downer [1994] assumed that the decline ended in England and Wales in 1983. Likewise, in Swiss children of the Canton of Zurich, an end of the decline in the primary teeth became evident in 1988 [Steiner et al., 1991]. In the first survey of 1964, the average dmft was 7.6. In 1988, 1992, 1996 and 2000, Swiss children had dmft averages between 1.5 and 1.8. This corresponds to reductions of 76–80% from 1964 to the 'stable' period of 1988–2000.

Table 2. Average dmfs and DMFS counts in the Hague: Dutch children with high or low SES and immigrants from Turkey and Morocco

	Dutch nationals		Turkey	Morocco
	high SES	low SES		
Age 6, dmfs				
1996	0.8	4.7	5.3	5.1
1998	0.5	4.3	6.8	4.1
2002	0.7	4.1	7.4	4.0
Age 12, DMFS				
1996	0.3	1.6	3.4	2.8
1998	0.1	2.0	2.1	1.5
2002	0.4	0.6	1.0	0.9

From Truin et al. [unpublished data].

Recent caries statistics from children having high and low SES in The Hague are presented in table 2. In the high-SES children aged 6, the average dmfs varied between 0.5 and 0.8 from 1996 to 2002. By contrast, in the low-SES children, the average dmfs remained at 4.7 (1996) and 4.1 (2002), thus showing little if any improvement in the 6 years. Children immigrated from Turkey and Morocco also had on average between 4.0 and 7.4 dmfs in the 6-year period.

At the age of 12 years, the average DMFS in the Dutch high-SES children was very low, between 0.1 and 0.4 DMFS. In the low-SES children, 1.6 and 2.0 DMFS were counted in 1996 and 1998, respectively, but the latest average, of 2002, was as low as 0.6 DMFS. In the Turkish and Moroccan children, the averages were still at 3.4 and 2.8 in 1996, but had fallen to 1.0 and 0.9, respectively, by 2002.

There is no doubt that numbers of legal as well as illegal immigrants will increase in the near future. For proper interpretation of epidemiological data, both the immigration status, country of origin as well as the length of stay in the guest country need to be recorded and reported.

These data illustrate that once the average dmf or DMF counts are low or very low, there will be instability or oscillation. In the high-SES Dutch children (the averages of whom are presented in table 2), 79–93% had dmfs or DMFS equal to zero. Accordingly, the few children with counts of 2 or higher can make the averages unstable. Another factor may even be more important: fillings

Table 3. Average dmft counts in Swiss children and immigrants

	Immigrated in last 2 years from		
	Ex-Yugoslavia	other	all
City of Zurich immigrants 1994, age 7–8	7.2	3.8	5.9
City of Zurich, age 7 children	Swiss	Immigrants	All
1993	1.7	4.9	2.9
1998	1.7	3.8	2.7
Canton of Zurich[1], age 7 children	Swiss[1]	Immigrants from Ex-Yugoslavia	All
1988	1.8	–	–
1992	1.6	–	–
1996	1.5	5.9	1.9
2000	1.8	6.9	2.4
City of Winterthur, Canton of Zurich 2001, age 5	1.7	7.8	2.4

[1] 16 communities, not comprising the cities Zurich and Winterthur.
Data compiled from Menghini et al. [2003a, b] and Steiner et al. [1988, 1994].

placed by dentists who continue to have diverging ideas about when to place a filling and when this should not be done. 'White' fillings have also become a problem. It is inevitable that part of them are not identified by the examiner with the effect that the F component, which in Western Europe has long become much larger than the D and M component, is underestimated to some extent. At the very low caries levels in highly industrialized countries, it is therefore difficult to identify minor changes in caries prevalence, which might be very interesting for scientific research. However, the conventional examination procedures are sufficient to detect substantial increases in caries prevalence should they in fact occur.

New diagnostic methods, particularly for fissure caries where the majority of caries lesions and fillings occur, may provide more reliable bases for determining whether decay levels decrease even further, remain constant or whether they increase [Lussi and Francescut, 2003]. The intensity of research regarding the identification of carious predilection sites is evident from ORCA abstracts No. 50–68 [Caries Res 2003;37:284–290].

The effect of immigrated children on overall caries experience is more obvious in Switzerland than in the Netherlands. Swiss children 7 years of age in the City of Zurich on the one hand and 16 other towns and villages on the other all had dmft averages between 1.5 and 1.8 (table 3). A special investigation in 1994 showed that immigrant children from the former Yugoslavia had 7.2 dmft on average while other immigrants had 3.8, still twice as high as that of Swiss children in the nineties (first line in table 3). When the Swiss children were pooled with those of foreign origin, who constituted as much as 42% of all schoolchildren in the City of Zurich in 2000, the dmft average increased from 1.7 to 2.9 (1993) and from 1.7 to 2.7 (1998). In the 16 communities outside the City, pooling Swiss with foreign children led to an increase of the average dmft from 1.5 to 1.9 (1996) and from 1.8 to 2.4 (2000); in the entire Canton, the percentage of non-Swiss schoolchildren was 27% but has been increasing since. Figure 3 shows dmft averages of 7-year-old children, comprising Swiss and immigrants, in 5 locations in various parts of Switzerland. The increases of caries prevalence after 1988 were at least partially due to increasing immigration. The fact that in 2001 children of Swiss origin in Winterthur (the second largest city in the Canton of Zurich) already had 1.70 dmft at the age of 5 years [Menghini et al., 2003a] suggests that levels of primary tooth caries might increase in Swiss children, too.

Extensive surveys carried out in Great Britain compared dmft data from the period 1989/90 with most of those of 2001/2002. Pitts et al. [2003] concluded 'that the marked geographic variation seen previously is still evi-

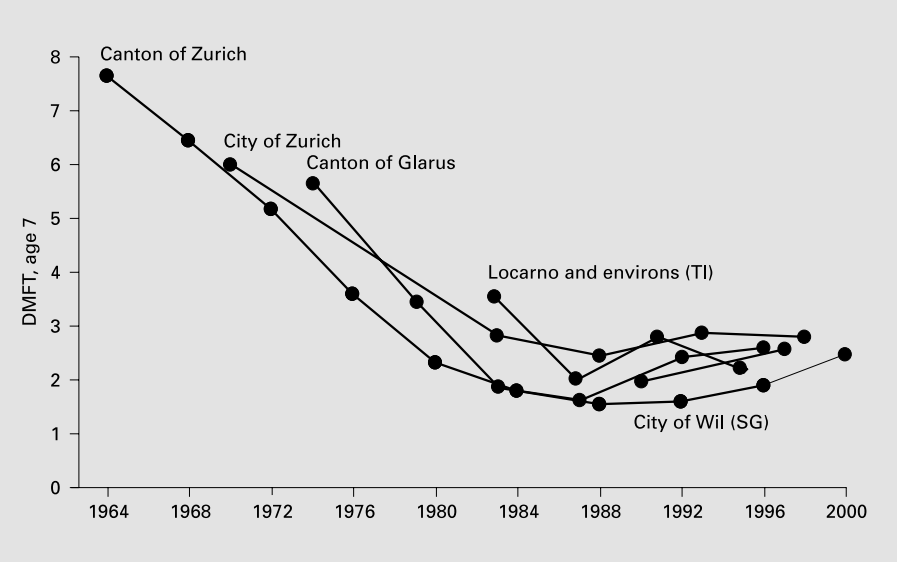

Fig. 3. Average dmft in 7-year-old children (permanent residents and immigrants pooled) in various towns or regions of Switzerland.

Table 4. Average dmft/DMFT counts in various parts of the United Kingdom (% with counts equal to zero, or caries-free)

	Year of survey	England Southwest	England Northwest	Wales	Scotland
Age 5, dmft[1]	2001/02	1.11 (67%)	2.06 (51%)	2.26 (47%)	
Age 12, DMFT	2000/01	0.78 (65%)	1.25 (51%)	1.31 (49%)	
Age 14, DMFT[2]	1998/99	1.35 (52%)	2.16 (37%)	2.25 (37%)	2.75 (32%)

Age 5: from Pitts et al. [2003]; age 12: from Pitts et al. [2002]; age 14: from Pitts et al. [2000].

[1] South and North instead of South-West and North-West.

[2] For Northern Ireland, the respective figures were 3.65 (22%).

dent'. Similarly, from 1996 to 2000, the average DMFT at age 12 was reduced by approximately 0.1 but the typical disparities between the regions persisted [Pitts et al., 2002], the DMFT averages being lowest in the Southern parts of England. The results confirm Downer's [1994] statement that the data available up to 1993 (from England and Wales) 'suggest that caries levels have now levelled out...' while 'the national data conceal widespread disparities between different regions of the country...'. In fact, for 12-year-old children, the overall average was 0.89 DMFT in 2000/01 as compared to 1.1 and 1.2 in 1992/93 (averages from two different surveys), but in 2000/2001 Wales and the North West still had DMFT averages of 1.31 and 1.25 [Pitts et al., 2002]. It is evident from table 4, showing averages for ages 5, 12 and 14, that caries counts were consistently lowest in South-West England. These averages, based on examinations of large numbers of children (between 3,750 and 61,324), suggest that the 'bottom' prevalence eventually reached may be at different levels for counties, regions or countries.

It is important to note that the decline is carried on into adult age. This was most clearly assessed in military recruits. In Switzerland, their DMFT at age 20 was 16.0 in 1970 but by 1996 had decreased to 4.8 (including extracted premolars) or 4.4 (counting only extracted first molars, which were very rare, in the DMFT) [Menghini et al., 2001]. These authors summarized that in recruits of Australia, Denmark, England and Wales, Germany, Norway, Sweden and the USA, reductions ranging from 18 to 66% have occurred in recent years. Secular improvements of dental health in adults is a vast field, and many more papers on this topic may appear in the near future.

Central and Eastern Europe

This part of Europe comprises countries with different economic situations, all being substantially less strong economically than Western Europe. The three Baltic countries, the Czech Republic, Hungary, Poland, Slovakia, Slovenia with a total population of approximately 70 million will become members of the European Union in May 2004. Apparently only one country among them, Slovenia, has experienced/obtained a substantial and continued decline of dental caries prevalence. In 1987, the average DMFT in children 12 years of age was 5.1, but had decreased to 1.8 in 1998. The corresponding averages for 18-year-olds were 12.7 and 7.0, a reduction by 46%. The advantage in this country was that the school dental service was not thrown overboard when the one-party system was abandoned. The preventive measures and the treatment level offered by the school dental service were maintained or improved [Vrbic, 2000].

Until 1989, Eastern Germany was ruled under the communist one-party system and in essence isolated from Western Europe. For decades, large numbers of children were examined in many cities. The findings were analyzed in detail [Künzel, 1997]. In the present context, the last 15 years are of special interest. In 1986/87, just before the borders between the two Germanies fell, 12-year-old children had 3.8 DMFT on average. By 1994, the average had fallen to 2.5, a reduction of 34%. Recent reports indicate that the average in this part of Germany continues to decrease. The most recent statistics from Eastern Germany indicate average DMFT counts between 1.2 and 1.4 (unpublished latest reports from Chemnitz, the former Karl Marx Stadt, where water fluoridation was abandoned in 1989, and from Dresden and Erfurt). The encouraging developments in Slovenia and Eastern Germany may illustrate how rapidly caries prevalence can be reduced when conditions are favorable and/or proper action is taken.

In the countries joining the European Union in 2004, caries is higher than in Western Europe. Available data suggest that in some countries, minor declines may have occurred since 1989. The introduction of organized prevention such as school-based dental health education has been difficult since the previously existing systems of school dental care were mostly abolished in the early nineties. Additional stumbling blocks are the high prices of 'state-of-the-art' fluoride toothpastes and toothbrushes, prices which are 2–4 times higher than in Western Europe when related to the typical family incomes in these countries. Under these circumstances it is difficult to promote dental hygiene and the use of topical fluorides such as in dentifrices, gels and rinses. Salt fluoridation, which would be by far the cheapest measure, is often authorized; however, initiatives to induce people to use such salt are minimal in most countries. This unfavorable situation is coupled with the fact that dental treatment will remain unaffordable for the lower or even middle SES for many years to come. It seems to be difficult to convince the ministries of health and the majority of the population that the cost of prevention is very low when compared to treatment cost, and that the improvements in dental health would be substantial and cost of treatment reduced in the long run.

Implementation of prevention was a relatively slow process in Western Europe. There is a new situation in the sense that many dentists in Central Europe – and sometimes health officers as well – are aware of the dramatic decline of caries prevalence which has taken place in Western Europe. This may hopefully stimulate preventive efforts in these countries so that positive developments may be expected in the near future, particularly in the countries joining the European Union in May 2004.

Outlook

The decline in caries prevalence in Western Europe has been very substantial. It has received much attention until recently but is now often taken for granted. However, caries prevalence, still very different when looking at various parts of Europe, may undergo unexpected changes due to various factors. Increasing immigration has been identified as a new factor, leading to increases of the overall dental caries prevalence in Switzerland (20% non-Swiss residents), the Netherlands and Germany. Caries epidemiology continues to be an important issue in both oral health surveillance and research into refined methods for caries diagnosis. Some pertinent observations may be summarized as follows:

(1) Politicians in some countries tend to think that dental caries is no longer an urgent topic; they may even reassure themselves with the illusion that the problem has been solved 'for ever'.

(2) Dental schools have been reluctant in their reaction to reform and adapt the dental curriculum to the new situation.

(3) Antifluoridationists persist in opposing various uses of fluorides but their impact is fading: the predicted adverse effects have not occurred and the success of preventive dentistry is obvious; their ideas, however, continue to surface when steps are taken to intensify measures based on fluorides.

(4) In Central and Eastern Europe, caries prevalence is still high and there are no signs of substantial improvements; in addition, misleading contentions of untoward effects of fluorides (as used for prevention of dental caries) are still widespread.

(5) On the global scale, only a minority of children benefit from caries prevention and fluorides.

Acknowledgment

The help of Dr. G. Menghini and Dr. M. Steiner in setting up the figures and reading the text, tables and references is gratefully acknowledged.

References

Bratthall D: Introducing the Significant Caries Index together with a proposal for a new global oral health goal for 12-year-olds. Int Dent J 2000;50:378–384.

Bratthall D, Hänsel-Petersson G, Sundberg H: Reasons for the caries decline: What do the experts believe? Eur J Oral Sci 1996;104:416–422.

Cochran WG: Sampling Techniques. New York, Wiley & Sons, 1953.

Downer M: Caries prevalence in the United Kingdom. Int Dent J 1994;44:365–370.

Ericsson Y (ed): Progress in Caries Prevention. Caries Res 1978;(suppl 1):1–112.

FDI: Dental caries; in Hine MK (ed): Epidemiology of Selected Dental Conditions 1950–1963. Bethesda, Fédération Dentaire Internationale, National Library of Medicine, 1964.

von der Fehr FR: Caries prevalence in the Nordic countries. Int Dent J 1994;44:371–378.

von der Fehr FR, Haugejorden O: The start of caries decline and related fluoride use in Norway. Eur J Oral Sci 1997;105:21–26.

Gray PG, Todd JE, Slack GL Bulman JS: Adult Dental Health in England and Wales in 1968. London, Office of Population Censuses and Surveys, Social Survey Division, HMSO, 1970.

Kann J: Erfaringer fra et mundhygiejnisk profylakseprogram in boernetandpleieregie. Tandlaegebladet 1968;72:317–330.

König KG: Aktuelle Empfehlungen zum Fluoridgehalt in Kinderzahnpasten: Konsequenzen für die systemische Fluoridierung. Gesundheitswesen 2002;64:33–38.

Künzel W: Caries decline in Deutschland. Heidelberg, Hüthig, 1997.

Lussi A, Francescut P: Performance of conventional and new methods for the detection of occlusal caries in deciduous teeth. Caries Res 2003; 37:2–7.

Marthaler TM: Caries-inhibiting effect of fluoride tablets. Helv Odontol Acta 1969;13:1–13.

Marthaler TM: Decrease of DMF-levels 4 years after the introduction of a caries-preventive program, observations in 5,819 schoolchildren of 20 communities. Helv Odontol Acta 1972; 16:45–68.

Marthaler TM, König KG: Der Einfluss der Fluortablettengaben in der Schule auf den Kariesbefall 6- bis 15jähriger Kinder. Schweiz Monatsschr Zahnheilkd 1967;77:539–554.

Marthaler TM, O'Mullane DM, Vrbic V: The prevalence of dental caries in Europe 1990–1995: ORCA Saturday afternoon symposium 1995. Caries Res 1996;30:237–255.

Marthaler TM, Steiner M, Menghini GD, Bandi A: Caries prevalence in Switzerland. Int Dent J 1994;44:393–401.

Menghini GD, Steiner M, Leisebach T, Weber RM: Kariesprävalenz von 5-Jährigen der Stadt Winterhur im Jahre 2001. Schweiz Monatsschr Zahnmed 2003a;113:519–523.

Menghini GD, Steiner M, Marthaler TM, Helfenstein U, Brodowski D, Imfeld C, Weber R, Imfeld T: Kariesprävalenz von Schülern in 16 Zürcher Landgemeinden in den Jahren 1992 bis 2000. Schweiz Monatsschr Zahnmed 2003b;113:267–277.

Menghini GD, Steiner M, Marthaler TM, Weber RM: Rückgang der Kariesprävalenz bei Schweizer Rekruten von 1970–1996. Schweiz Monatsschr Zahnmed 2001;111:410–416.

National Center for Health Statistics: Decayed, missing and filled teeth in adults, United States, 1960–62. PHS Publ No 1000, Series 11, No 23. Washington, Public Health Service, US Government Printing Office, 1967.

National Center for Health Statistics: Decayed, missing and filled teeth among children (age 6–11, 1963–65). PHS Publ No 1000, Series 11, No 106. Washington, Public Health Service, US Government Printing Office, 1971.

National Center for Health Statistics: Decayed, missing and filled teeth among youths 12–17 years (1966–70). PHS Publ No 1000, Series 11, No 144. Washington, Public Health Service, US Government Printing Office, 1974.

Naylor MN (ed): Second International Conference on Declining Caries. Int Dent J 1994;44:363–458.

Pitts NB, Boyles J, Nugent ZJ, Thomas N, Pine CM: The dental caries experience of 5-year-old children in England and Wales. Surveys coordinated by the British Association for the Study of Community Dentistry in 2001/2002. Community Dent Health 2003;20:45–54.

Pitts NB, Evans DJ, Nugent ZJ: The dental caries experience of 14-year-old children in the United Kingdom. Surveys coordinated by the British Association for the Study of Community Dentistry in 1998/99. Community Dent Health 2000;17:48–53.

Pitts NB, Evans DJ, Nugent ZJ, Pine CM: The dental caries experience of 12-year-old children in England and Wales. Surveys coordinated by the British Association for the Study of Community Dentistry in 2000/2001. Community Dent Health 2002;19:46–53.

Renson CE, Crielaers PJA, Ibikunle SA, Pinto VG, Ross CB, Sardo Infirri J, Takazoe I, Tala H: Changing patterns of oral health and implications for oral health manpower: Part I. Int Dent J 1985;35:235–251.

Rieder F: Sechsjahrresultate mit kombinierter Kariesprophylaxe nach den Empfehlungen des SSO-Seminars für Jugendzahnpflege 1961. Schweiz Monatsschr Zahnheilkd 1967;77: 1058–1059.

Sigrist H, Marthaler TM: Abfall der DMF-Zahnzahl bei 8- und 9jährigen Kindern nach 4 Jahren überwachten Zähnebürstens. Dtsch Zahnärztl Z 1975;30:294–299.

Steiner M, Marthaler TM, Bandi A, Menghini G: Prävalenz der Milchzahnkaries in 16 Gemeinden des Kantons Zürich in den Jahren 1964 bis 1988. Schweiz Monatsschr Zahnmed 1991;101:738–742.

Steiner M, Menghini GD, Curilovic Z, Marthaler TM: Kariesbefall der Schüler der Stadt Zürich im Zeitraum 1970–1993. Schweiz Monatsschr Zahnmed 1994;104:1210–1218.

Todd JE: Children's Dental Health in England and Wales 1973. Office of Population Censuses and Surveys. London, Her Majesty's Stationery Office, 1975.

Truin GJ: Kariesprävention und die Erfolge der kinderzahnärztlichen Betreuung in den Niederlanden. Zahnärztl Gesundheitsdienst 1997; 27:8–13.

Truin GJ, König KG, Bronkhorst EM: Caries prevalence in Belgium and the Netherlands. Int Dent J 1994;44:379–385.

Vrbic V: Reasons for the caries decline in Slovenia. Community Dent Oral Epidemiol 2000;28: 126–132.

Wegelin H: Erfahrungsbericht und statistische Auswertung der Kariesprophylaxe bei Schulkindern im Kanton St. Gallen. Schweiz Monatsschr Zahnheilkd 1964;74:1043–1059.

Yates F: Sampling Methods for Censuses and Surveys. London, Griffin, 1949.