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Caries prevalence in Belgium and The Netherlands

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Summary

A list of epidemiological caries studies performed since 1980 in Belgium and The Netherlands was compiled by a literature search and analysed with respect to study design, methods of clinical investigation and the availability of dmft (DMFT) data. The percentages of caries-free 6-year-old children in The Netherlands and Belgium are currently similar. In The Netherlands the data suggest a halt in the decline of caries prevalence since the mid 1990s among 6-year-olds. According to WHO criteria, 12-year-old children in The Netherlands now have a very low caries experience. Children in Belgium belong to the moderate caries experience category. Recent data from the two countries indicate a further decrease in caries prevalence of 12-year-olds during the last decade. Caries prevalence data of adults in Belgium are not available. In The Netherlands the average DMFT-score in the older age groups has hardly changed since 1970. Changes in percentages of edentates in the period 1980–1990 probably reflect part of the changes in oral health status of Dutch adults. The intervention of many methodological problems and confounding factors, such as cultural differences, limit national and international comparisons of caries prevalence data sets.

In the late 1970s and early 1980s, results of epidemiological studies in the US and several Western countries demonstrated that dental caries was declining among schoolchildren^{1–6}. Although caries prevalence is now low in most European countries⁷, the question arises as to whether a further decrease in caries prevalence has taken place in the 1990s in Belgium and The Netherlands. This paper describes trends in dental caries among schoolchildren and adults in Belgium and The Netherlands, based on caries surveys performed between 1980 and 1993.

Materials and methods

A list of epidemiological studies in schoolchildren and adults since 1980 in the two countries was compiled by a literature search. All volumes of the Belgium journals 'Belgisch Tijdschrift voor Tandheelkunde', 'Revue Belge de Medicine Dentaire' and the Dutch journal 'Nederlands Tijdschrift voor Tandheelkunde' (period 1980–1993) as well as theses and reports available on dental surveys in Belgium and The Netherlands, available in the library of

the dental school in Nijmegen, were checked for papers on dental surveys among children and adults. Besides this search, the references contained in these articles were reviewed. The list of reviewed studies from Belgium was sent for a cross-check to the UCL Department de Médecine Dentaire et Stomatologie in Brussels (Prof. Dr. J. P. van Nieuwenhuysen). The list of studies for The Netherlands, published earlier⁸ was checked by a scientist in the Department of Community Dental Health and Epidemiology, TNO National Institute of Health (Dr. H. Kalsbeek).

The studies, including those on 5- to 7- (primary dentition) and 11- to 13-year-old children (permanent dentition), were then screened with respect to design (number of subjects, sampling procedures), methods of clinical investigation and availability of dmft (DMFT) data based on the WHO criterion that D (d) was defined as dentinal caries, and percentages of caries-free subjects.

Caries prevalence in Belgium

From the four preselected studies, one survey was excluded as the dmft/DMFT averages obtained in a study

Table 1 Data of epidemiological caries surveys amongst 5- to 7- (primary dentition) and 11- to 13-year-old children (permanent dentition), performed between 1980 and 1993 in Belgium

Age	Municipality	Year of investigation	Ref.	Number of children	X-ray	dmft	% caries-free	DMFT	% caries-free
5	Flémalle	1983	10		—		43		
5.6	Flandres	1989–1991	11	3534	—	1.65	59		
11	Liege	1983	12	130	—	2.0		3.0	12*
12	Liege	1983	12	113	—			3.9	12*
12		1980–1984	13	adjusted				3.9	
12		1985–1988	13	adjusted				3.3	
12.6	Flandres	1989–1991	11	4163	—			2.7	25*

* Caries-free includes the primary and permanent dentition.

in Brussels and surroundings⁹ included enamel lesions (D₂) and could not, therefore, be used for a comparison. Average dmft values from the studies in Flémalle were not published. The available data are compiled in *Table 1*. Unfortunately, the lack of data makes it impossible to analyse trends in dental caries in 5- to 7- and 11- to 13-year-olds on a scientific basis. The percentages of caries-free 5- to 7-year-old children from surveys in Flémalle (1983) and Flandres (1989–1991) suggested an increase of the percentages of caries-free children in the 1990s. The DMFT averages among 11- to 13-year-old children obtained in Liege (1983) and Flandres (1989–1991), indicate a decrease of caries prevalence in this age group in the period 1983–1991. Caries prevalence data of adults in Belgium are not available.

Caries prevalence in The Netherlands

In The Netherlands caries data of schoolchildren have been collected systematically at regular intervals in a standardised way. This made it possible to obtain a chronological record of changes in caries experience. By meta-analysis based on all known epidemiological caries studies, general conclusions regarding trends in prevalence of dental caries among schoolchildren can be drawn. *Tables 2 and 3* present the list of all epidemiological studies on 5- to 7- and 11- to 13-year-old children performed in The Netherlands between 1980 and 1993. A meta-analysis was applied on all these studies. The criteria for selection were; representativeness of the samples, uniformity of methods of clinical investigation and availability of dmft/DMFT data, including standard

Table 2 Data of epidemiological caries surveys amongst 5- to 7-year-old children (primary dentition), performed between 1980 and 1993 in The Netherlands

Age	Municipality	Year of investigation	Ref.	Number of children	X-ray	dmft	% caries-free
5.9	Culemborg	1981	14	118	+	4.1	31
5.8	Amsterdam	1981	15	159	+	3.7	35
5.0	Veenendaal	1982	16	116	+	2.4	53
6.2	N.O. Friesland	1982	17	152	+	2.5	45
5.8	Soesterberg	1984	18	140	+	1.7	65
5.8	Den Haag	1984	19	188	+	1.1	65
4.6	Smallingerland	1984	20	212	+	0.8	77
4.6	Heereveen	1984	20	170	+	1.3	69
4.9	Haarlem	1985	21	330	—	0.9	72
6.5	Tiel	1985	22	188	—	2.7	49
6.7	Culemborg	1985	22	95	—	3.3	44
5.9	Heereveen	1986	20	139	+	1.9	55
5.9	Smallingerland	1986	20	250	+	1.7	61
6.1	Midden Brabant	1988	23	213	—	2.6	47
6.1	Stadsgewest Breda	1988	23	126	—	3.2	48
6.4	N.O. Friesland	1988	24	213	—	2.4	47
6.1	Midden Holland	1989	23	154	—	1.9	54
5.7	Den Haag	1989	25	218	+	1.5	60
5.7	Amsterdam	1989	26	94	—	2.1	55
5.7	Texel	1992	27	160	—	1.4	66
5.2	Veenendaal	1993	28	122	—	2.1	55
5.7	Den Haag	1993	29	218	—	1.3	55

Table 3 Data of epidemiological caries surveys among 11–13-year-old children (permanent dentition), performed between 1980 and 1993 in The Netherlands

Age	Municipality	Year of investigation	Ref.	Number of subjects	X	DMFT	% caries-free
11	Amersfoort	1981	Not pub.	709	+	2.9	21
11.9	N.O. Friesland	1982	17	131	+	3.2	23
11.3	Tiel	1984	30	165	+	2.2	38
11.3	Culemborg	1984	30	125	+	1.9	33
12	Den Bosch a.s.	1987	31	502	–	2.7	28
12	N.O. N. Brabant	1987	31	524	–	1.7	46
11.1	Stadsgewest Breda	1988	23	145	–	1.3	53
11.9	N.O. Friesland	1988	24	236	–	1.6	45
12.2	Eemland	1988	23	157	–	1.5	43
12.4	Z. Kennemerland	1989	23	134	–	1.6	48
11.0	Midden Holland	1989	23	193	–	1.0	60
11.9	Den Haag	1989	25	147	+	1.2	51
11.7	Amsterdam	1989	26	103	–	1.3	52
11.7	Texel	1992	27	159	–	0.9	57
11.9	Den Haag	1993	29	184	–	0.9	63

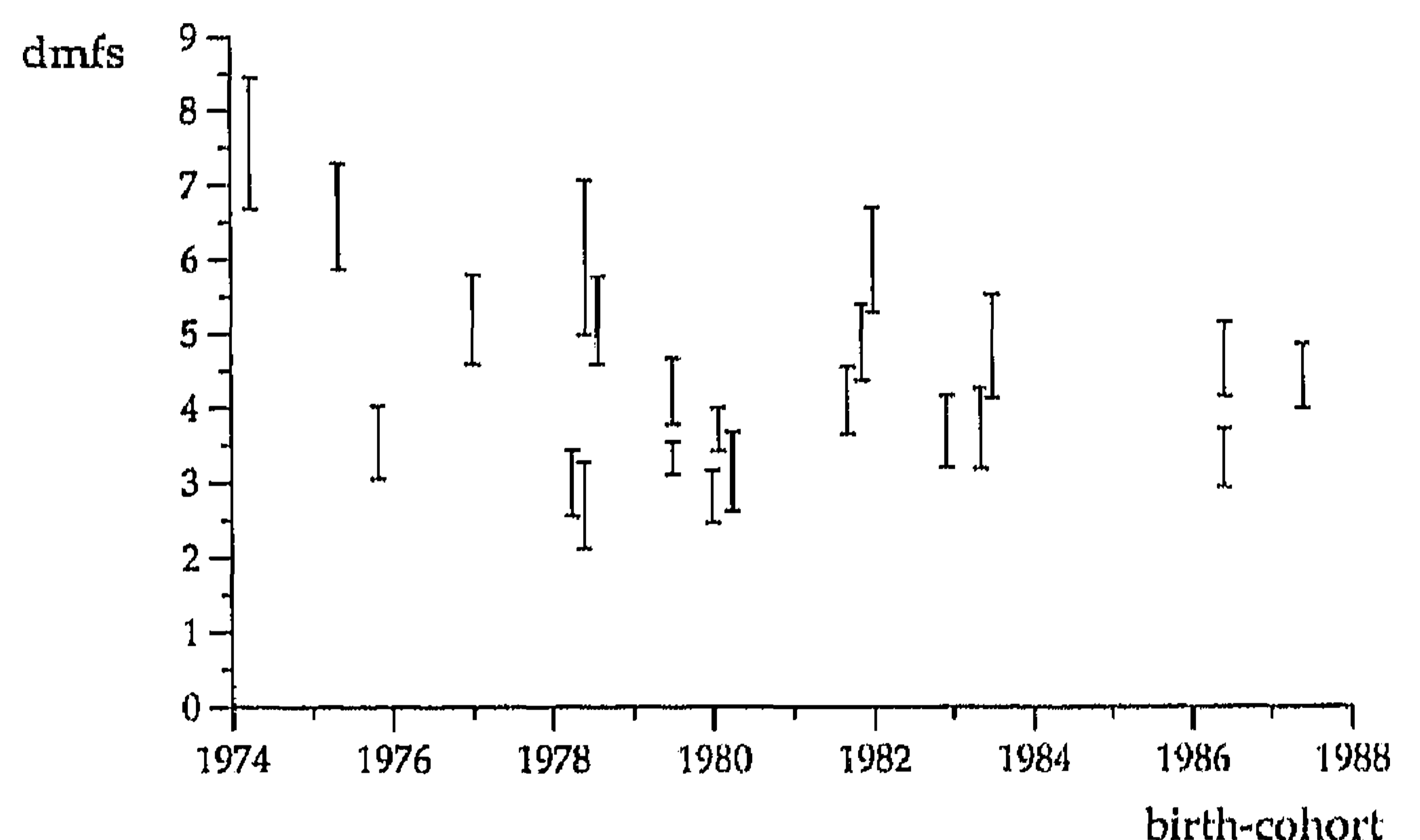
deviations.

Before starting the meta-analysis, mean dmfs and DMFS scores from surveys in which no bite-wing radiographs were taken, were corrected for the higher detection rate achievable by use of radiographs. A score of 0.6 dmfs was added to the averages of the clinically diagnosed dmfs scores of 5–6-year-olds; the 'radiographic' correction on the mean DMFS scores of 11–12-year-olds score was estimated to result in an increase of 0.2⁸. Multiple regression analyses with weighted residuals (1/SEM) involving age and year of birth (cohort year) have been performed to assess cohort effects on mean dmfs and DMFS scores. From the analysis on dmfs/DMFS averages it appears that after 1983 a halt in the decline of caries prevalence among 6-year-olds occurred, whereas among 12-year-olds the earlier decrease in mean DMFS scores continued through the period 1980–1993. In order to obtain a graphical presentation of the cohort effects, mean dmfs and DMFS scores have been corrected to the (arbitrarily chosen) ages of 6 and 12 years by using the obtained regression coefficients with age and also corrected for the 'radiographic' effect.

Figure 1 shows the mean dmfs scores (and standard errors of the mean) of 6-year-olds by birth cohort, corrected for age. Until the birth cohort year 1981, a decrease in the mean dmfs scores was observed. In the cohorts following, a halt in the decrease of average dmfs scores was found. The mean DMFS scores of 12-year-old children showed a linear decreasing trend by corresponding birth cohort year (Figure 2).

About 55 per cent of the 5- to 7-year-old children in 1993 had a completely caries-free deciduous dentition; about 60 per cent of the 12-year-old children had a caries-free permanent dentition. Until 1985 epidemiological studies in The Netherlands were focussed on school-age children. In 1985 a local oral health survey of adults took place in a medium sized town in The Netherlands³², followed in 1986 by the first National

Dental Survey of the adult population carried out in The Netherlands^{33,35}. Unfortunately, a lack of continuity of representative studies amongst adults makes it impossible to study trends in dental caries in adults on a scientific basis. However, an indication of a trend in dental caries among adults can be given. Figure 3 includes the average


Figure 1

- Average dmfs scores and standard errors corrected to the age of 6 years according to birth cohort.
- Indices moyens caos et erreurs-type corrigées jusqu'à l'âge de 6 ans selon la cohorte de naissance.
- Mittlere DMFT-Werte und Standardabweichungen, altersmäßig auf 6 Jahre korrigiert, nach Geburtskohorten.
- Valores promedios CPO y errores estándares corregidos hasta la edad de 6 años según el cohorte de nacimiento.

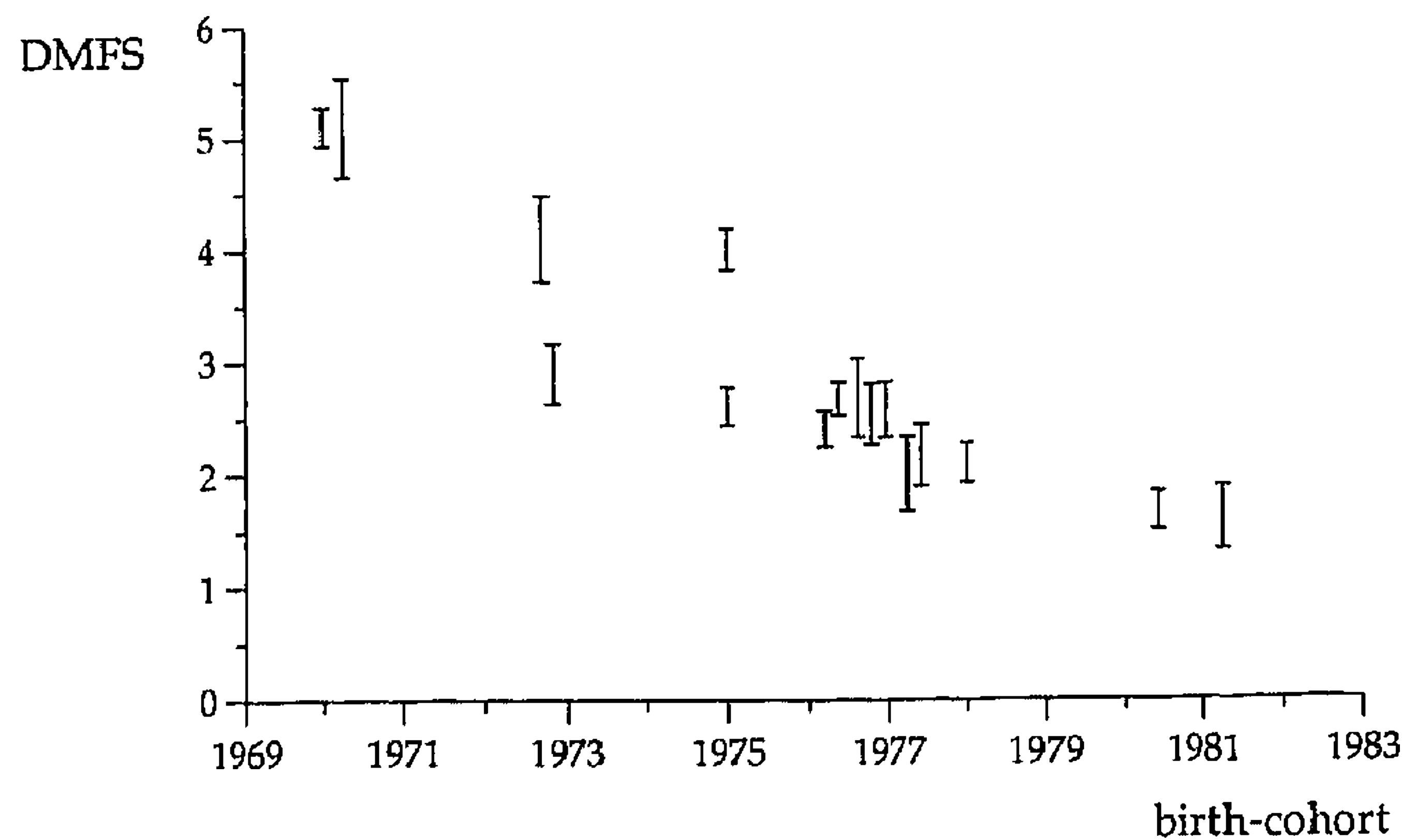


Figure 2

- Average DMFS scores and standard errors corrected to the age of 12 years according to birth cohort.
- Indices moyens CAOS et erreurs-type corrigées jusqu'à l'âge de 12 ans selon la cohorte de naissance.
- Mittlere DMFS-Werte und Standardabweichungen, altersmäßig auf 12 Jahre korrigiert, nach Geburtskohorten.
- Valores promedios CPO y errores estándares corregidos hasta la edad de 12 años según el cohorte de nacimiento.

age-specific DMFT-scores, reported in dental surveys amongst adults performed in The Netherlands between 1970 and 1989. The data refer to the permanent dentition and have been plotted from the age of 5–6 years. Based on the data of surveys performed between 1970 and 1980, three S-shape curves were drawn (by visual regression); a minimum (lowest DMFT-scores), a maximum (highest DMFT-scores) and an average DMFT-variant. In the same figure the average DMFT-scores, reported in studies after 1980, are plotted (small broken line). The change in the age-specific average DMFT-scores and the slope of the curve in the younger age groups are evident. In the older age groups the average DMFT-score has hardly changed.

In the 1970s, percentages of edentulousness remained virtually constant in the Netherlands. About 32 per cent of the population of 16 years and older were edentulous in this period³⁶. Since 1980 a decline in edentulousness has taken place. According to recent results from a CBS-survey (1992) 24.4 per cent of the Dutch population, 16 years and older, had full dentures in 1988–1990³⁷. Changes in percentages of edentates in the period 1980–1990 probably reflect part of the changes in oral health status of Dutch adults.

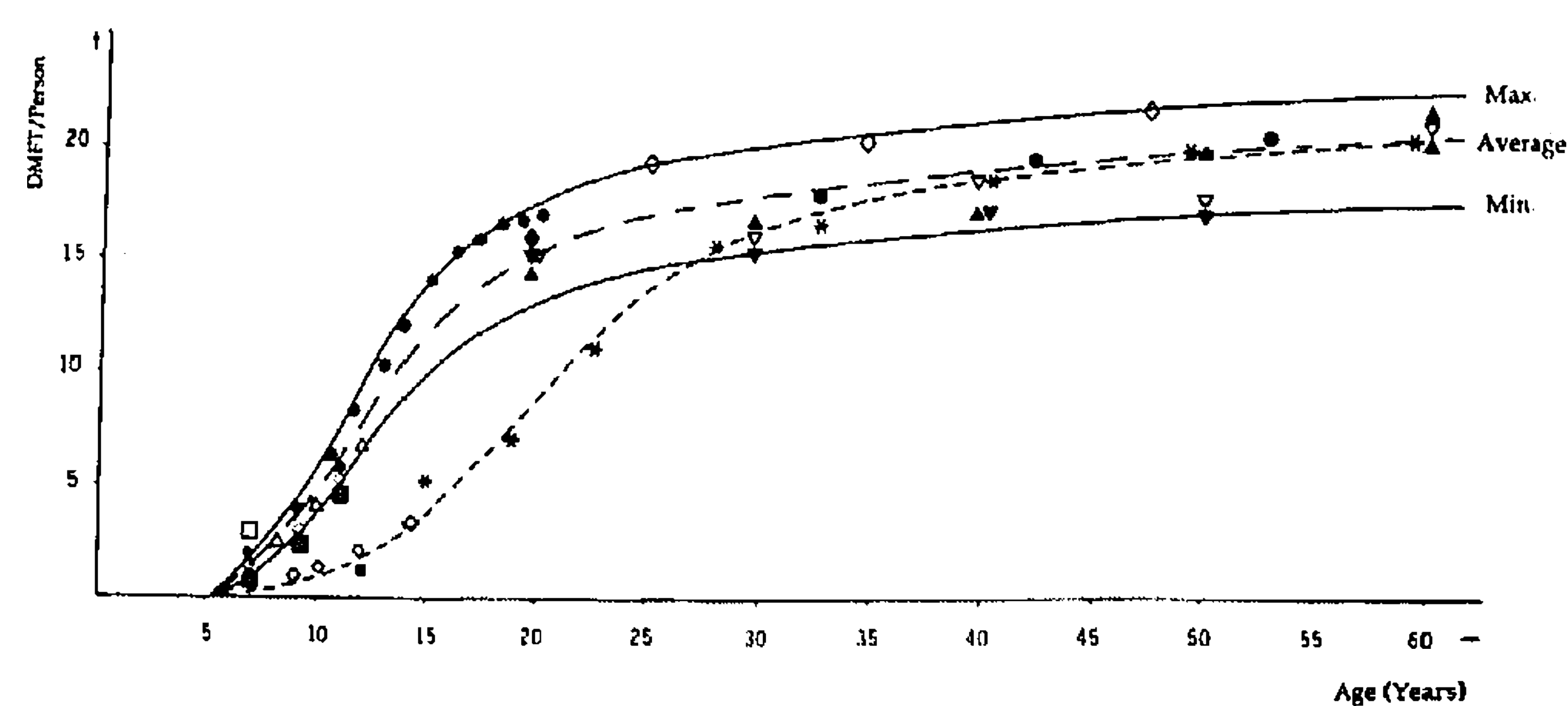


Figure 3

- Average age-specific DMFT scores, reported in dental surveys performed in The Netherlands between 1970 and 1989.
- Indices moyens CAOD par l'âge, indiqués dans les études dentaires réalisées aux Pays-Bas entre 1970 et 1989.
- Mittlere altersspezifische DMFT-Werte, Quelle: in den Niederlanden zwischen 1970 und 1989 durchgeführte Untersuchungen.
- Valores promedios CPO Dde edad específica, indicados en estudios dentales llevados a cabo entre 1970 y 1989 en los Países Bajos.

Discussion

Study designs and data collection methods are topics which require careful consideration and presentation¹⁹. When data are collected systematically at regular intervals in a standardised way, it is possible to obtain a record of changes in a country's caries experience. Good data sets of schoolchildren were only available for The Netherlands. The number and representativeness of studies performed in Belgium were limited, and only give an indication of the dental health of the child population.

Besides this, many methodological problems, limiting national and international comparisons, intervened. Both the way in which samples were drawn and the diagnostic methods used further limited the validity, reliability and comparability of the data reviewed. When comparing caries data between countries and analysing reasons for differences in oral health between countries, additional confounding factors such as diverse social, cultural, dietary and oral hygiene habits as well as professional standards and financing of health care play an intervening role. Therefore, it should be stressed again that national and international comparisons of caries prevalence data in populations are questionable when collection and presentation of data are not standardised. Although these limitations have been stressed many times, too often incomplete or non-standardised data are still collected and published.

Fréquence globale des caries en Belgique et aux Pays-Bas

F

Résumé

Une liste d'étude épidémiologique sur les caries, réalisée après 1980 en Belgique et aux Pays-Bas, a été compilée par une recherche de la littérature et analysée sur le plan de la conception de l'étude, des méthodes de recherche clinique et de l'accès aux données CAOD et caod. Le pourcentage d'enfants de 6 ans sans carie aux Pays-Bas et en Belgique est actuellement similaire. Aux Pays-Bas, les données suggèrent une interruption de la réduction de la fréquence globale des caries depuis la seconde moitié de 1990 chez les enfants de 6 ans. Selon les critères de l'OMS, les enfants de 12 ans des Pays-Bas ont maintenant un bilan carieux très bas. En Belgique, les enfants appartiennent à la catégorie de bilan carieux modeste. Des données récentes provenant de ces deux pays indiquent une nouvelle diminution de la fréquence globale carieuse chez les enfants de 12 ans au cours des dix dernières années. Les données de fréquence globale des caries chez les adultes en Belgique ne sont pas disponibles. Aux Pays-Bas, l'indice moyen CAOD chez les groupes plus âgés n'a pratiquement pas changé depuis 1970. Les changements des pourcentages des personnes édentées pour la période 1980–1990 reflètent probablement, en partie, l'évolution de la situation de la santé bucco-dentaire des adultes néerlandais. L'intervention de nombreux problèmes méthodologiques et de facteurs déconcertant, notamment les différences culturelles, limite les comparaisons nationales et internationales de données de fréquence globale de caries.

D

Kariesprävalenz in Belgien und den Niederlanden

Zusammenfassung

Eine Liste der epidemiologischen Kariesstudien, die nach 1980 in Belgien und den Niederlanden durchgeführt worden sind, wurde nach Ermittlung betreffender Literatur in bezug auf Ziele und Methoden der klinischen Untersuchung sowie der Verfügbarkeit von dmft- und DMFT-Daten zusammengestellt. Die Prozentsätze an kariesfreien 6jährigen Kindern in den Niederlanden und Belgien sind derzeit ähnlich. In den Niederlanden weisen die Daten auf einen Stopp des Rückgangs der Kariesprävalenz seit Mitte der 90er Jahre unter 6jährigen Kindern hin. Nach den Kriterien der WHO beurteilt weisen 12jährige Kinder in den Niederlanden nun sehr niedrige Kariesprävalenz auf. Kinder in Belgien sind der Kategorie niedrige Kariesprävalenz zuzuordnen. Die jüngsten Daten aus den beiden Ländern lassen einen weiteren Rückgang der Kariesprävalenz bei 12jährigen Kindern über die letzten zehn Jahre erkennen. Daten über die Kariesprävalenz bei Erwachsenen in Belgien sind nicht verfügbar. In den Niederlanden haben sich die DMFT-Werte höherer Altersgruppen seit 1970 kaum verändert. Es ist anzunehmen, daß die prozentualen Veränderungen in bezug auf die Zahnlosigkeit zwischen 1980 und 1990 teilweise die Änderungen hinsichtlich des Mundgesundheitsstatus niederländischer Erwachsener widerspiegeln. Methodologische Probleme und komplexe Faktoren wie kulturelle Unterschiede schränken die Möglichkeiten des Vergleichs nationaler und internationalen Daten über die Kariesprävalenz ein.

E

Prevalencia de caries en Bélgica y en los Países Bajos

Resumen

En una investigación de literatura se compiló y examinó una lista de estudios de casos epidemiológicos que se llevaron a cabo en Bélgica y los Países Bajos después de 1980, con respecto al diseño del estudio, métodos de investigación clínica y disponibilidad de datos correspondientes al CPO. Los porcentajes de niños de 6 años libres de caries son actualmente similares en los Países Bajos y en Bélgica. En los Países Bajos, los datos sugieren que desde mediados de 1990 se ha detenido el descenso de la prevalencia de caries entre niños de 6 años de edad. Según los criterios de la OMS, la experiencia de caries en niños de 12 años de edad en los Países Bajos, es ahora baja. Los niños belgas pertenecen a la categoría de experiencia de caries moderada. Datos recientes de los dos países indican otro descenso, durante la última década, de la prevalencia de caries en niños de 12 años. En Bélgica, no hay datos sobre la prevalencia de caries en adultos. En los Países Bajos, la tasa promedio CPO en grupos de más edad apenas si ha cambiado desde 1970. Los cambios en los porcentajes de edéntulos en el período 1980–1990, reflejan

probablemente parte de los cambios en el estado de la salud bucodental de los adultos holandeses. La intervención de muchos problemas metodológicos y factores confusos como diferencias culturales, limitan las comparaciones nacionales e internacionales de datos sobre la prevalencia de caries.

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