Caries experience and care in Germany: results of the 6th German Oral Health Study (DMS • 6)

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Objectives: One goal of the 6th German Oral Health Study (DMS • 6) was to survey the caries experience and care for caries in a representative cross-sectional study across Germany. **Method and materials:** Using almost the same methodology as the previous studies DMS III (1997) to V (2014), data were collected on caries experience (including dmft/DMFT, root caries) in the three standard World Health Organization age groups (12-year-olds, 35- to 44-year-olds, and 65- to 74-year-olds) as well as among 8- and 9-year-olds. **Results:** The caries experience expressed as dmft/DMFT in 8- and 9-year-olds was 1.4 teeth, 59.9% were caries-free; the DMFT among 12-year-olds was 0.5 teeth, with 77.6% caries-free. There was a significant decrease in caries-related restorations among 35- to 44-year-olds, with DMFT being 8.3 teeth. The group of 65- to 74-year-olds had a DMFT of 17.6 teeth, which was mainly due to higher tooth retention; 5.0% were edentulous. The prevalence of root caries was 13.8% among 35- to 44-year-olds and 59.1% among 65- to 74-year-olds. **Conclusions:** The various oral health measures taken over recent decades seem to continue to have a positive impact in terms of reduced caries experience. Nevertheless, it appears that the maximum has been reached among 12-year-olds; however, within this group there continues to be a strong polarization of dental caries in adolescents from families with a low education status and a comparatively high treatment need for the primary teeth. The social gradient in tooth decay and tooth loss extends over the entire life span. The DMS • 6 study, being representative of the oral epidemiology of the population, shows the sustainability of successful prevention measures for caries in all age groups and education groups in Germany. At the same time, social inequalities persist. From a socio-medical perspective, it would make sense to align future prevention strategies specifically to the lifeworld of groups and communities that have not yet been reached. *(Quintessence Int 2025;56(Suppl):S30–S39; doi: 10.3290/j.qi.b5986212)*

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With the First/Second German Oral Health Study (DMS I [West Germany]/DMS II [East Germany]) in 1989 and 1992, the Institute of German Dentists (Institut der Deutschen Zahnärzte, IDZ) laid the foundation for a representative socio-epidemiologic monitoring of oral health and dental care status.[1,2] The high caries rate in children was of particular interest; it initially extended beyond the risk teeth of the first four molars and was the reason for the introduction of group and individual prophylaxis measures in Germany.[1] Since DMS III (1997), a continuous decline in dental caries in 12-year-olds has been observed, remaining at a low level since DMS IV (2005).[3,4] For adults and seniors, significantly lower decayed, missing, and filled teeth (DMFT) values only appeared from the last DMS V (2014) onwards.[5] This was attributable to different DMFT components in the two groups. In adults, since 1997 this has been primarily due to the decline in restorations, from 11.7 to 8.6 teeth; in seniors 11.1 instead of the previous 17.6 missing teeth were found, but, in contrast to the adults, there was no clear trend for restorations. Due to the increase in dental maintenance in seniors, the prevalence of root caries increased compared to DMS III (1997).[3-5]

Therefore, one goal of the 6th German Oral Health Study (DMS • 6) was to survey the caries experience and oral health care in younger children (8- and 9-year-olds), younger adolescents (12-year-olds), younger adults (35- to 44-year-olds), and younger seniors (65- to 74-year-olds) in a representative cross-sectional study across Germany.

Method and materials

The general methodology of the study is presented in separate articles.[6-8] The DMS • 6 has been approved by the Institutional Review Board (IRB) of the Witten/Herdecke University, Witten, Germany (registration number S-249/2021). This study is registered at the German Clinical Trials Register (registration number DRKS00028701).

Sample

The dental data on the younger children were collected as part of the earlier orthodontic module of DMS • 6.[9,10] The analyses included all children who satisfied the inclusion criteria for the analysis set of the orthodontics module and in whom dental and caries findings were comprehensively recorded.

For the other age groups, all participants who satisfied the inclusion criteria for DMS • 6 analyses were included. In total, data from 692 younger children, 958 younger adolescents, 927 younger adults, and 797 younger seniors was included in the analysis.

Measurement methods

Coronal caries experience

The recording of caries in younger children was done using the International Caries Detection and Assessment System (ICDAS)[11]; the results were then converted into the dmf/DMF index. Carious surfaces with an ICDAS code of 5 or higher were classified as DT. For the other age groups, only clear clinically observable caries lesions were recorded (as usual in the DMF index). They included all stages and the consequences of caries, including restorations or extractions due to caries. Single-tooth crowns were considered caries-related restorations, whereas crowns to anchor dentures were not. Active lesions (white spots) and inactive lesions (brown spots) were recorded seperately. If an approximal lesion shone through to the vestibular or oral (anterior tooth, lateral tooth) or occlusal tooth surface (lateral tooth), this was registered as caries. The primary carious surface was recorded each time; adjacent surfaces in the case of proximal lesions were only recorded if the defect extended beyond the marginal ridge. Restorations for other reasons, such as trauma or molar incisor hypomineralization (MIH), were not included in the caries experience. Filled surfaces with simultaneous caries were assessed as carious if dentin caries was present; at the filling margin this was recorded as secondary caries.

Root caries experience

Root caries was recorded separately for younger adults and younger seniors and was not included in the DMF index. A root surface was considered carious if cavity formation with or without softening was observed. A distinction was made between active lesions (rather yellowish, soft to leathery – root surface gave way when prodded with a periodontal probe) and inactive lesions (brown to black, hard – root surface did not give way when probed). If root caries or a restoration at the root of the tooth was a continuation from the crown of the tooth that did not extend more than 2 mm to the adjacent root area, no findings were recorded for the root.

Variables and statistical analysis

Coronal caries experience was expressed as DMF index. Caries-free (prevalence) was defined as DMFT = 0.[12,13] In the 8- and 9-year-olds, due to the mixed dentition, the caries experience was calculated as a combination of dmf (for primary teeth) and DMF index (for permanent teeth) according to the following rules: Missing anterior primary teeth (central and lateral incisors, canines) were scored as "not erupted" and were not counted as missing due to caries; missing primary molars, on the other hand, were counted as missing due to caries. The degree of restoration was calculated as a ratio (FT/FT + DT) × 100. The Significant Caries Index (SiC)[14] was calculated to determine the caries risk group in children. If the prevalence of caries experience was less than one third in the age group, the dynamic Significant Caries Index (dSiC) was given as the percentage of people with caries experience and their mean caries experience.[15] The calculation of the prevalence of root caries experience was a binary recording at the participant level, including inactive, active, and secondary lesions as well as fillings. In order to obtain population-representative prevalence data, edentulous study participants were included in the prevalence calculation. The Root Caries Index (RCI) was used to describe its extent.[16]

For the epidemiologic description of caries experience and care, prevalences and means with associated 95% confidence intervals (CIs) were calculated using a weighted dataset. The aim was to compensate for different probabilities in the selection of subjects and differences in gender, age, and region compared to the population in Germany by using the weighted dataset. Numbers (n) are provided without weighting. Detailed information on data handling and statistical methods is described previously.[8]

Table 1 Caries experience and care in younger children (8- and 9-year-olds)

Variable	Entire dentition
No. of participants (n)	692
Caries-free (prevalence, dmft/DMFT = 0)	59.9% (56.2; 63.5)
dmft/DMFT	1.4 (1.2; 1.6)
dt/DT	0.4 (0.3; 0.4)
mt/MT	0.3 (0.2; 0.3)
ft/FT	0.8 (0.7; 0.9)
Increased caries risk (DAJ) (%)	4.2 (2.9; 5.9)
SiC	4.1 (3.8; 4.4)
dSiC	40.1%; 3.5 (3.2; 3.8)
Degree of restoration of coronal caries (%)	71.6 (66.8; 76.3)
Participants in need of treatment (prevalence, DT > 0)	16.0% (13.4; 18.8)
Primary teeth crowns (prevalence)	2.8% (1.7; 4.1)
No. of primary teeth crowns, if ≥ 1 primary tooth crown	1.4 (1.0; 1.9)

Data are presented as unweighted numbers (n) and weighted percentages or weighted means (with 95% confidence intervals) for younger children with valid information on dmft/DMFT. Indexes written in lowercase letters refer to the primary dentition.
DAJ, Deutsche Arbeitsgemeinschaft für Jugendzahnpflege e. V. (German Working Group for Adolescent Dental Care); DMFT, decayed, missing, filled teeth; dSiC, dynamic SiC (percentage of persons with caries experience; their mean caries experience); DT, decayed teeth; FT, filled teeth; MT, missing teeth; SiC, Significant Caries Index.

Results

Caries experience and care in younger children (8- and 9-year-olds)

The entire dentition was free of caries in 59.9% of younger children. The mean caries experience was 1.4 teeth (dmft 1.3; DMFT 0.1); of these, 0.4 teeth were carious (dt 0.3; DT 0.0), 0.3 were missing due to caries (mt 0.2; MT 0.0), and 0.8 teeth had restorations (ft 0.7; FT 0.1). In total, 2.8% of younger children had primary tooth crowns. An increased caries risk as defined by the criteria of the German Working Group for Adolescent Dentistry (DAJ: dmft/DMFT > 7 or DT > 2) was found in 4.2% of younger children. The SiC was 4.1 teeth. The degree of restoration was 71.6%, and 16.0% of younger children required treatment. For caries-free status, caries experience, and increased caries risk, a gradient was found along the family education status (Table 1 and Appendix 1).

Caries experience and care in younger adolescents (12-year-olds)

The entire dentition was free of caries in 77.6% of younger adolescents. The mean caries experience in younger adolescents was 0.5 DMF teeth; of these, 0.2 teeth were carious and 0.4 teeth had restorations. Tooth loss due to caries was almost nonexistent in this age group. Younger adolescents had an average of 0.5 teeth with active initial lesions. An increased caries risk as defined by the criteria of the DAJ showed 3.3% with DT on at least one approximal surface.[17] The dSiC was 2.4 teeth for 22.4% of younger adolescents. Fissure sealings were observed in 59.5%, and younger adolescents with fissure sealings had an average of 4.6 sealed teeth. The degree of restoration was 71.6%, and 8.4% of younger adolescents required treatment. For caries experience and the number of carious teeth, there was a clear gradient along the family education status: caries experience was four times higher in adolescents with a low family education status than in adolescents with a high family education status (Tables 2 and 3).

Caries experience and care in younger adults (35- to 44-year-olds)

The mean caries experience in younger adults was 8.3 DMF teeth; of these, 0.5 teeth were carious, 1.0 teeth were missing due to caries, and 6.8 teeth had restorations. Younger adults were free of caries in 6.9% of cases, and complete edentulism was practically nonexistent in this age group (0.1%). Fissure sealing was observed in 13.8% of younger adults. The degree of restoration for coronal caries was 92.3%, and 21.9% of younger adults required treatment. In total, 26.1 teeth were sound or filled (FST index). Approximately one in seven younger adults had root caries (13.8%), the affected proportion of exposed root surfaces (RCI) was 8.3%, and the associated degree of restoration was 67.9% (Table 2).

For caries-free status, caries experience, tooth loss, and degree of rehabilitation of the root caries, there was a (sometimes strong) gradient along the education status (Table 3).

Caries experience and care in younger seniors (65- to 74-year-olds)

In total, 5.0% of younger seniors were edentulous. The mean caries experience was 17.6 DMF teeth; of these, 0.4 teeth were carious, 8.6 teeth were missing due to caries, and another 8.6 teeth had restorations. There were no caries-free people in the group of 65- to 74-year-olds. The degree of restoration of

Table 2 Caries experience and care in younger adolescents (12-year-olds), younger adults (35- to 44-year-olds), and younger seniors (65- to 74-year-olds)

Variable	12-year-olds	35- to 44-year-olds	65- to 74-year-olds
No. of participants (n)	958	927	797
Edentulism (prevalence)	0.0% (NA)	0.1% (0.0; 0.5)	5.0% (3.7; 6.7)
Caries-free (prevalence, DMFT = 0)	77.6% (74.8; 80.1)	6.9% (5.4; 8.7)	0.0% (NA)
No. of teeth with active initial lesions	0.5 (0.4; 0.6)	1.2 (1.0; 1.3)	0.2 (0.1; 0.2)
Caries experience (prevalence, DMFT > 0)	22.4% (19.9; 25.1)	93.1% (91.3; 94.6)	100.0% (NA)
DMFT = 0 + active initial lesions = 0 (prevalence)	68.9% (65.9; 71.8)	5.4% (4.1; 7.0)	0.0% (NA)
Fissure sealing (prevalence)	59.5% (56.4; 62.6)	13.8% (11.7; 16.1)	NA
No. of sealed teeth if ≥ 1 sealed tooth	4.6 (4.3; 4.8)	3.6 (3.1; 4.2)	NA
DMFT	0.5 (0.5; 0.6)	8.3 (8.0; 8.7)	17.6 (17.2; 18.0)
DT	0.2 (0.1; 0.2)	0.5 (0.4; 0.6)	0.4 (0.3; 0.5)
MT	0.0 (0.0; 0.0)	1.0 (0.9; 1.2)	8.6 (8.0; 9.2)
FT	0.4 (0.3; 0.4)	6.8 (6.5; 7.1)	8.6 (8.2; 9.0)
FST	24.6 (24.4; 24.9)	26.1 (25.9; 26.3)	18.8 (18.2; 19.4)
ST	24.3 (24.0; 24.5)	19.3 (18.9; 19.6)	10.2 (9.8; 10.6)
Increased caries risk (DAJ) (%)	3.3 (2.3; 4.6)	NA	NA
SiC	1.5 (1.3; 1.7)	NA	NA
dSiC	22.4%; 2.4 (2.2; 2.6)	NA	NA
DMFS	0.8 (0.7; 0.9)	21.7 (20.4; 23.0)	69.9 (67.8; 71.9)
DS	0.2 (0.1; 0.3)	0.9 (0.7; 1.1)	0.8 (0.6; 1.0)
MS	0.1 (0.0; 0.1)	4.9 (4.2; 5.6)	40.7 (38.1; 43.3)
FS	0.5 (0.4; 0.6)	15.9 (15.0; 16.8)	28.4 (26.9; 29.8)
Root caries (prevalence)	NA	13.8% (11.7; 16.1)	59.1% (55.7; 62.5)
No. of teeth with active root or secondary lesions	NA	0.1 (0.0; 0.1)	0.4 (0.3; 0.4)
No. of teeth with filled root surfaces	NA	0.2 (0.1; 0.3)	1.5 (1.3; 1.7)
Root Caries Index (%)	NA	8.3 (6.7; 9.9)	20.4 (18.4; 22.3)
Degree of restoration of coronal caries (%)	71.6 (66.1; 77.1)	92.3 (91.0; 93.6)	92.9 (91.4; 94.3)
Participants in need of treatment (prevalence, DT > 0)	8.4% (6.8; 10.3)	21.9% (19.3; 24.6)	20.0% (17.4; 23.0)
Degree of restoration of root caries* (%)	NA	67.9 (58.6; 77.1)	76.9 (73.3; 80.6)

Data are presented as unweighted numbers (n) and weighted percentages or weighted means (with 95% confidence intervals).
*The degree of restoration of root caries (%) was calculated as follows: (no. of teeth with filled root surfaces / (no. of teeth with filled root surfaces + no. of teeth with active root or secondary lesions)) × 100.
DMFS, decayed, missing, filled tooth surfaces; DMFT, decayed, missing, filled teeth; DS, carious tooth surfaces; dSiC, dynamic SiC (percentage of persons with caries experience; their mean caries experience); DT, decayed teeth; FS, filled tooth surfaces; FST, filled or sound teeth; FT, filled teeth; MS, missing tooth surfaces; MT, missing teeth; NA, not available; SiC, Significant Caries Index; ST, sound teeth.

coronal caries was 92.9%, and 20.0% of the study participants required treatment. The FST index was 18.8 teeth. Over half of people aged 65 to 74 had root caries (59.1%), the affected proportion of exposed root surfaces (RCI) was 20.4%, and the associated degree of restoration was 76.9% (Table 2).

For complete edentulism (low education status 8.8%, vs high education status 1.9%) and for tooth loss (MT; low education status 11.3 teeth, vs high education status 5.5 teeth) there was a clear social gradient. This was also reflected in caries experience (DMFT) and the FST index (Table 3).

Table 3 Caries experience and care in younger adolescents (12-year-olds), younger adults (35- to 44-year-olds), and younger seniors (65- to 74-year-olds), by gender and education group

		Gender		Education group		
Age group	Variable	Male	Female	Low	Medium	High
12-year-olds	No. of participants (n)	484	473	84	420	383
	Caries-free (prevalence, DMFT = 0)	76.7% (72.8; 80.3)	78.5% (74.5; 82.0)	59.0% (48.3; 67.8)	74.3% (69.8; 78.3)	84.7% (80.7; 87.9)
	No. of teeth with active initial lesions	0.5 (0.3; 0.6)	0.5 (0.3; 0.7)	1.0 (0.5; 1.5)	0.6 (0.4; 0.8)	0.3 (0.2; 0.4)
	DMFT = 0 + active initial lesions = 0 (prevalence)	68.4% (64.3; 72.4)	69.4% (64.9; 73.4)	49.5% (39.1; 58.9)	64.9% (60.1; 69.4)	76.2% (71.7; 80.2)
	Fissure sealing (prevalence)	55.8% (51.4; 60.1)	63.3% (58.7; 67.5)	51.0% (41.1; 60.9)	61.7% (56.9; 66.3)	60.5% (55.5; 65.3)
	No. of sealed teeth if ≥ 1 sealed tooth	4.3 (4.0; 4.5)	4.9 (4.5; 5.2)	3.1 (2.6; 3.7)	4.6 (4.3; 5.0)	4.8 (4.4; 5.2)
	DMFT	0.6 (0.5; 0.7)	0.5 (0.4; 0.6)	1.2 (0.8; 1.6)	0.6 (0.5; 0.7)	0.3 (0.2; 0.4)
	DT	0.2 (0.1; 0.2)	0.1 (0.1; 0.2)	0.4 (0.2; 0.6)	0.2 (0.1; 0.2)	0.1 (0.0; 0.1)
	MT	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)
	FT	0.4 (0.30; 0.5)	0.4 (0.3; 0.5)	0.8 (0.5; 1.1)	0.4 (0.3; 0.5)	0.2 (0.2; 0.3)
	Degree of restoration of coronal caries (%)	70.6 (63.0; 78.1)	72.9 (64.7; 81.1)	62.0 (47.5; 76.4)	73.2 (65.3; 81.0)	76.0 (65.8; 86.2)
35- to 44-year-olds	No. of participants (n)	459	467	80	408	383
	Edentulism (prevalence)	0.1% (0.0; 1.0)	0.0% (0.0; 0.0)	0.7% (0.1; 5.4)	0.0% (0.0; 0.0)	0.0% (0.0; 0.0)
	Caries-free (prevalence, DMFT = 0)	7.8% (5.6; 10.5)	6.1% (4.2; 8.5)	0.4% (0.0; 2.9)	5.8% (3.8; 8.3)	10.2% (7.5; 13.7)
	No. of teeth with active initial lesions	1.1 (0.9; 1.3)	1.2 (1.0; 1.4)	1.4 (0.8; 1.9)	1.3 (1.0; 1.5)	1.1 (0.9; 1.3)
	DMFT = 0 + active initial lesions = 0 (prevalence)	5.9% (4.1; 8.5)	4.9% (3.2; 7.1)	0.4% (0.0; 2.9)	4.8% (3.0; 7.1)	7.6% (5.3; 10.7)
	DMFT	7.9 (7.4; 8.4)	8.7 (8.2; 9.2)	11.4 (10.1; 12.8)	8.8 (8.3; 9.3)	7.0 (6.5; 7.6)
	DT	0.6 (0.5; 0.7)	0.5 (0.3; 0.6)	1.2 (0.8; 1.6)	0.4 (0.3; 0.5)	0.4 (0.2; 0.5)
	MT	1.1 (0.8; 1.3)	1.0 (0.8; 1.2)	3.1 (2.1; 4.2)	1.1 (0.9; 1.3)	0.4 (0.3; 0.5)
	FT	6.3 (5.9; 6.7)	7.3 (6.8; 7.7)	7.1 (6.0; 8.2)	7.3 (6.8; 7.7)	6.3 (5.8; 6.7)
	FST	26.0 (25.7; 26.3)	26.1 (25.9; 26.4)	23.5 (22.4; 24.6)	26.1 (25.8; 26.3)	26.8 (26.6; 27.0)
	ST	19.7 (19.2; 20.2)	18.9 (18.4; 19.4)	16.4 (15.1; 17.8)	18.8 (18.3; 19.3)	20.5 (20.0; 21.0)
	Root caries (prevalence)	15.7% (12.6; 19.4)	12.0% (9.3; 15.2)	14.9% (8.9; 24.0)	14.4% (11.3; 18.1)	12.0% (9.1;15.7)
	No. of teeth with active root or secondary lesions	0.1 (0.0; 0.3)	0.0 (0.0; 0.1)	0.1 (0.0; 0.3)	0.1 (0.0; 0.1)	0.1 (0.0; 0.2)
	No. of teeth with filled root surfaces	0.2 (0.1; 0.3)	0.2 (0.1; 0.3)	0.2 (0;0; 0.6)	0.2 (0.1; 0.3)	0.2 (0.1; 0.3)
	Root Caries Index (%)	10.0 (7.5; 12.5)	6.5 (4.5; 8.6)	16.5 (7.1; 25.9)	9.2 (6.6; 11.8)	6.2 (4.1; 8.3)
	Degree of restoration of coronal caries (%)	90.4 (88.2; 92.5)	94.1 (92.6; 95.6)	80.3 (73.4; 87.1)	94.1 (92.5; 95.8)	94.5 (92.8; 96.1)
	Degree of restoration of root caries* (%)	65.5 (52.9; 78.2)	70.8 (56.7; 84.8)	45.6 (8.8; 82.5)	71.6 (58.4; 84.7)	83.3 (70.3; 96.3)
65- to 74-year-olds	No. of participants (n)	375	422	158	367	230
	Edentulism (prevalence)	6.4% (4.3; 9.2)	3.8% (2.2; 5.8)	8.8% (5.4; 13.6)	5.0% (3.0; 7.5)	1.9% (0.6; 4.2)
	DMFT	17.4 (16.8; 18.0)	17.9 (17.3; 18.4)	18.7 (17.8; 19.6)	17.6 (17.0; 18.2)	16.9 (16.3; 17.5)
	DT	0.5 (0.3; 0.7)	0.3 (0.3; 0.4)	0.5 (0.3; 0.7)	0.4 (0.3; 0.5)	0.4 (0.2; 0.6)
	MT	8.7 (7.8; 9.5)	8.5 (7.7; 9.3)	11.3 (10.0; 12.7)	9.0 (8.2; 9.9)	5.5 (4.6; 6.3)
	FT	8.2 (7.7; 8.8)	9.0 (8.5; 9.6)	6.9 (6.1; 7.7)	8.2 (7.6; 8.8)	11.0 (10.3; 11.7)
	FST	18.7 (17.8; 19.5)	19.0 (18.2; 19.7)	16.0 (14.7; 17.4)	18.5 (17.6; 19.3)	22.0 (21.1; 22.8)
	ST	10.4 (9.9; 11.0)	9.9 (9.4; 10.4)	9.1 (8.2; 10.0)	10.2 (9.7; 10.8)	10.9 (10.3; 11.5)
	Root caries (prevalence)	61.2% (56.2; 65.8)	57.1% (52.1; 61.7)	56.9% (49.6; 64.0)	56.5% (51.3; 61.7)	64.2% (57.8; 70.4)
	No. of teeth with active root or secondary lesions	0.5 (0.3; 0.6)	0.3 (0.2; 0.3)	0.3 (0.2; 0.4)	0.3 (0.2; 0.4)	0.4 (0.2; 0.6)
	No. of teeth with filled root surfaces	1.6 (1.3; 1.9)	1.4 (1.2; 1.7)	1.4 (1.0; 1.8)	1.5 (1.2; 1.8)	1.6 (1.3; 2.0)
	Root Caries Index (%)	20.8 (18.0; 23.6)	20.0 (17.3; 22.6)	20.4 (16.4; 24.5)	21.1 (18.1; 24.2)	18.5 (15.2; 21.7)
	Degree of restoration of coronal caries (%)	91.3 (89.0; 93.7)	94.3 (92.6; 96.0)	90.2 (86.3; 94.1)	93.9 (92.1; 95.7)	95.9 (94.0; 97.7)
	Degree of restoration of root caries* (%)	73.3 (67.9; 78.7)	80.8 (75.9; 85.7)	78.1 (70.3; 85.9)	76.4 (70.7; 82.1)	79.6 (73.1; 86.1)

Data are presented as unweighted numbers (n) and weighted precentages or weighted means (with 95% confidence intervals).
*The degree of restoration of root caries (%) was calculated as follows: (no. of teeth with filled root surfaces / (no. of teeth with filled root surfaces + no. of teeth with active root or secondary lesions)) × 100.
DMFT, decayed, missing, filled teeth; DT, decayed teeth; FST, filled or sound teeth; FT, filled teeth; MT, missing teeth; ST, sound teeth.
Two gender-diverse individuals are included in the education groups, but not in the gender categories.

Discussion

At the end of the 1980s, the introduction of individual and group prophylaxis for children and adolescents in Germany laid the foundation for a paradigm shift from reparative to preventive dental health care. The results have been impressive: since the introduction of these measures, caries experience has declined to one tenth of its initial level (DMFT 12-year-olds DMS I/II, 4.9 teeth, vs DMS • 6, 0.5 teeth) (Table 4). The decline in caries in children is a prime example of how socio-medical measures can address a significant health burden within the population. What was uncertain so far was the sustainability of these health improvements over a lifespan.

In the DMS V of 2014, the age group of younger adults (35- to 44-year-olds) was the first time that people who had benefited – at least partially – from individual and group prophylaxis in their childhood were included in a German Oral Health Study; the younger adults in the current survey were the first to fully benefit from these measures and have grown up in this prevention-oriented mindset. During this period, the caries burden in younger adults has halved from 16.9 teeth to 8.3 teeth, and the proportion of caries-free people in the population has risen from 0.4% to 6.9%. This caries decline is primarily due to fewer restorations (FT, DMS III [1997]: 11.7 teeth, vs DMS • 6 [2023]: 6.8). In particular, the decline in caries-related restorations among younger adults since 2005 is an indication of the sustained effectiveness of prevention not just in studies but under everyday conditions.

A focus on prevention with the aim of lifelong tooth retention, and developments in health technology, have also led to a sharp decline in tooth loss in the overall population. This is visible very clearly in the development of complete edentulism. While in 1997, a quarter of 65- to 74-year-olds were edentulous, today the figure is only 5%. Tooth loss in general is also in decline in all age groups (1997 to 2023, 35- to 44-year-olds: −4.6 teeth; 65- to 74-year-olds: −9.0 teeth) and is responsible for the declining caries experience, especially among younger seniors.

However, the positive caries epidemiologic developments are offset by a pronounced social gradient along the education status. Even in younger adolescents, it should be noted that both the number of (untreated) carious teeth and the caries experience as a whole is four times higher in adolescents with a low family education status than in those with a high family education status. This imbalance extends over the entire lifespan, up to complete edentulism in 65- to 74-year-olds, with a difference factor of 4.6 in that group. However, epidemiologic data must be viewed in a differentiated manner, as a comparison of the caries-related health gains among 12-year-olds according to different endpoints reveals contrasting developments with regard to the social gradient. On the one hand, 12-year-olds with a low family education status have experienced relatively fewer health gains in caries experience than those with a high family education status (DMFT; low education status: DMS I/II 5.8 teeth, DMS • 6 1.2, decline by a factor of 5 vs high education status: DMS I/II 3.1 teeth, DMS • 6 0.3, decline by a factor of 10). On the other hand, adolescents with a low family education status have experienced relatively more health gains in terms of caries-free status (DMFT = 0; low education status: DMS I/II 8.6%, DMS • 6 59.0%, increase by a factor of 6.9 vs high education status: DMS I/II 24.2%, DMS • 6 84.7%, increase by a factor of 3.5).

One strength of DMS • 6 is that, in addition to the cross-sectional oral epidemiologic study and social science survey to determine disease prevalence and behavior, study participants from the previous study DMS V were also examined again, so that disease progression and incidence can be reported. Cause–effect relationships with risk factors can also be better identified in this way. These results will be published in spring 2026. A further strength that can be noted is that since the First/Second German Oral Health Study in 1989/1991, younger children in the mixed dentition phase were examined for the first time, making it possible to make population-wide statements on primary tooth decay.

Some of the difficulties of the globally used index for recording caries experience (DMF index) should be noted. There are various reasons for these:

- In epidemiologic studies, it is hardly possible to identify the actual causes of tooth loss. However, the index is intended to consider only tooth loss due to caries. Studies show that the main cause for tooth loss from the age of around 40 is periodontal disease.[18] It should therefore be assumed that the M component of the DMF index overestimates the caries experience. Although different causes for missing teeth are identified in dental care, sensitivity analyses show only minor differences in the M component when including teeth explicitly recorded as missing due to caries (procedure in the DMS • 6) compared to the calculation including all missing teeth (procedure in the DMS V).
- By definition, single tooth crowns belong in the F component of the DMF index, because it is assumed that these crowns were placed due to caries, while anchor crowns (to anchor dentures) were not. The extent to which this principle still corresponds to today's treatment realities, eg, as a result of implants, which did not exist when the index was first described in 1938, requires critical examination. Sensitivity

Table 4 Trends of caries experience and care in younger children (8- and 9-year-olds), younger adolescents (12-year-olds), younger adults (35- to 44-year-olds), and younger seniors (65- to 74-year-olds) from DMS I/II to DMS • 6

Age group	Variable	DMS I/II	DMS III	DMS IV	DMS V	DMS • 6
8- and 9-year-olds (entire dentition)	No. of participants (n)	825	NA	NA	NA	692
	Caries-free (prevalence, dmft/DMFT = 0)	21.1%	NA	NA	NA	59.9%
	dft/DFT†	4.4	NA	NA	NA	1.1
	dt/DT	2.3	NA	NA	NA	0.4
	ft/FT	2.2	NA	NA	NA	0.8
12-year-olds	No. of participants (n)	848*	1,043	1,383	1,468	958
	Caries-free (prevalence, DMFT = 0)	13.8%*	41.8%	70.1%	81.3%	77.6%
	Fissure sealing (prevalence)	NA	52.9%	71.7%	70.3%	59.5%
	Number of sealed teeth if ≥ 1 sealed tooth	NA	1.9	3.7	4.0	4.6
	DMFT	4.9*	1.7	0.7	0.5	0.5
	DT	1.8*	0.4	0.2	0.1	0.2
	MT	0.1*	0.0	0.0	0.1	0.0
	FT	3.1*	1.3	0.5	0.3	0.4
	Degree of restoration of coronal caries (%)	65.3*	79.5	78.1	74.6	71.6
35- to 44-year-olds	No. of participants (n)	815	655	925	966	927
	Edentulism (prevalence, DMFT = 0)	1.2%	1.1%	1.0%	0.8%	0.1%
	Caries-free (prevalence)	0.4%	0.8%	0.7%	2.5%	6.9%
	DMFT	16.9	16.1	14.5	11.2	8.3
	DT	1.7	0.5	0.5	0.5	0.5
	MT	5.6	3.9	2.4	2.1	1.0
	FT	9.6	11.7	11.7	8.6	6.8
	FST	NA	23.6	25.2	25.4	26.1
	ST	NA	11.9	13.5	16.8	19.3
	Root caries (prevalence)	NA	22.1%	21.5%	11.8%	13.8%
	Degree of restoration of coronal caries (%)	83.0	92.5	95.6	93.7	92.3
65- to 74-year-olds	No. of participants (n)	NA	1,367	1,040	1,042	797
	Edentulism (prevalence)	NA	24.8%	22.6%	12.4%	5.0%
	Caries-free (prevalence, DMFT = 0)	NA	0.3%	0.1%	0.1%	0.0%
	DMFT	NA	23.6	22.1	17.7	17.6
	DT	NA	0.3	0.3	0.5	0.4
	MT	NA	17.6	14.1	11.1	8.6
	FT	NA	5.8	7.7	6.1	8.6
	FST	NA	10.2	13.6	16.4	18.8
	ST	NA	4.4	5.9	10.3	10.2
	Root caries (prevalence)	NA	15.5%	45.0%	28.0%	59.1%
	Degree of restoration of coronal caries (%)	NA	93.2	94.8	90.6	92.9

Data are presented as unweighted numbers (n) and weighted percentages or weighted means.
*13- and 14-year-olds.
†Caries experience of 8- and 9-year-olds without missing teeth, as collection in the different surveys is not comparable.
DMFT, decayed, missing, filled teeth; DT, decayed teeth; FST, filled or sound teeth; FT, filled teeth; MT, missing teeth; NA, not available; ST, sound teeth.

analyses have shown that including anchor crowns increases the F component by half a tooth in younger adults and by 2.5 teeth in younger seniors. Based on these calculations, it can be assumed that the failure to record anchor crowns in the F component of the DMF index tends to underestimate the number of restorations. This assumption can be further substantiated by the fact that it can be assumed that modern tooth-colored restorations are also less easily spotted under field conditions of oral epidemiologic examinations (compared to easily recognizable amalgam fillings, for example).

- Finally, the DMF index can only increase across the lifespan; as an overall index, it does not reflect the dental care status, as from a functional perspective it makes a difference whether carious teeth have already been lost or have been functionally restored through restorations. For this reason, in 1987 Sheiham et al[19] developed the FST index, which combines filled (FT) and sound (ST) teeth. In the current study, younger adults had 26.1 sound and functional teeth (+2.5 teeth since 1997), and younger seniors had 18.8 teeth (+8.6 teeth since 1997). There has therefore been a significant increase in caries-related functionality, especially later in life.

For a national comparison, regional data on caries experience are available from the Study of Health in Pomerania (SHIP-Trend-0)[20] from 2008 to 2012. In this study, 35- to 44-year-olds had 7.8 teeth with caries experience and 65- to 74-year-olds had 11.3 teeth. Edentulism among younger seniors amounted to 15.1%. The mean caries experience was lower than the national average in both age groups, but the proportion of edentulism was significantly higher among younger seniors. In addition to methodologic variations in the definition of the DMF index, regional (care) differences could explain the discrepancies. For younger adolescents, data are available from the epidemiologic companion study on group prophylaxis from 2016.[21,22] In that study, 78.8% (DMS • 6: 77.6%) of 12-year-olds were caries-free and the mean caries experience was 0.44 (DMS • 6: 0.5) teeth. The dSiC was 2.1 teeth (DMS • 6: 2.4 teeth) in 21.2% (DMS • 6: 22.4%) of adolescents with DMFT > 0. Besides potential differences in how the findings are made and a temporal effect, the results appear comparable and could be an indication that the peak of the prevention potential has been achieved with the efforts deployed to date. It should, however, be noted that for organizational reasons, the younger adolescents in the DMS • 6 were on average slightly older than the age group of the same assignment in the DMS V. It is therefore possible that the true mean value of caries experience for 12-year-olds is currently somewhat lower.

In Europe, caries prevalence (dmft or DMFT > 0) in primary teeth is 21.4%[23] (DMS • 6: 38.7%) and in the permanent teeth of 12-year-olds is 44.1% (DMS • 6: 22.4%).[24] This confirms that the caries experience of 12-year-olds in Germany is comparatively low, but that the success of the prevention strategies has not yet been reproduced in primary teeth. As a result, in 2019 new early detection measures (and new billing items) for early childhood caries were included in the statutory health insurance. However, it should be noted that the data reported here do not yet reflect these new measures. Data comparing caries and edentulism in adults and seniors based on regional and national oral epidemiologic studies show for European comparison countries that both caries and edentulism in adults and seniors in Germany were already comparatively low before the current survey.[25] This classification is likely to have been reinforced with the now documented effectiveness of prevention orientation in all age groups.

Conclusion

The DMS • 6 study, being representative for the population in Germany, shows the sustainability of successful prevention measures for caries in all age groups and education groups in Germany. At the same time, social inequalities persist. From a socio-medical perspective, it would make sense to align future prevention strategies specifically to the lifeworld of groups and communities that have not yet been reached.

Disclosure

ARJ, KK, and DS are employed by the National Association of Statutory Health Insurance Dentists (KZBV). The authors declare that there are no conflicts of interest according to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. The interpretation of data and presentation of information is not influenced by any personal or financial relationship with any individual or organization.

Author contributions

All authors listed in the paper have made a sufficient contribution to meet the criteria for authorship according to the ICMJE guidelines. They have all read and approved the final manuscript. ARJ is the principal investigator of the DMS • 6, responsible for developing the clinical examinations, and author of the manuscript. HML is a member of the scientific advisory board of the DMS • 6, responsible for developing the clinical examina-

tions, and author of the manuscript. KK is the deputy pricipal investigator, responsible for the data analysis, and co-author of the manuscript. DS is jointly responsible for statistical data preparation and analysis. KB and US are members of the scientific advisory board of the DMS • 6, responsible for developing the clinical examinations, and co-authors of the manuscript.

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Appendix 1

Additional data available at: https://www.idz.institute/publikationen/online-journal-zahnmedizin-forschung-und-versorgung/caries-experience-and-care-in-germany-results-of-the-6th-german-oral-health-study-dms-6-online-appendix/.