# Correlations of the DMFT Index with Socioeconomic Status, Dietary Habits, and Lifestyle Factors in Children and Adolescents in a German Dental Practice in North Rhine-Westphalia

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**Abstract**

AIM: To examine the relationship of Decayed, Missing and Filled Teeth (DMFT) with socioeconomic status (SES), sugar intake, and oral hygiene habits.

METHODS: Dental charts of 76 adolescents aged 12–17 years, who attended a private practice in Erkelenz from 2012 to 2022, were reviewed. Baseline DMFT was linked to parental education, household income, insurance status, frequency of sugary snacks or drinks, tooth brushing, and preventive visits. Associations were analyzed with t-tests/ANOVA and Pearson or Spearman correlations; cases with missing variables were excluded.

RESULTS: Lower SES predicted higher DMFT (mean 3.4 vs 1.8; $p < 0.05$). Daily sugar consumption markedly increased DMFT compared to occasional intake (3.7 vs 1.6; $p < 0.05$). Brushing at least twice daily and attending at least one check-up per year were associated with reduced DMFT (1.9 vs 3.5; $p < 0.05$). Girls reported better hygiene routines; however, mean DMFT did not differ by sex ($p > 0.05$).

CONCLUSION: Socioeconomic disadvantage, frequent sugar exposure, and inconsistent oral hygiene independently increase caries risk in adolescents. Targeted health education and regular preventive visits could reduce SES-related inequalities and lower DMFT These findings merit confirmation in larger prospective, multi-centre studies.

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# 1 Introduction

Oral health in children and adolescents is a complex, multifactorial construct shaped by biological, behavioural and social determinants (Glick et al., 2016). The Decayed, Missing and Filled Teeth (DMFT) index has therefore been the benchmark for quantifying cumulative caries experience in permanent dentition for more than half a century (Broadbent & Thomson, 2005; Nadanovsky & Sheiham, 1995). While the most recent *Deutschen Mundgesundheitsstudien* (DMS V – VI) confirm a sustained decline in mean DMFT among 12-year-olds—from 4.9 in 1989 to 0.4 in 2021—these national averages hide sizable pockets of disease (Jordan, 2025, 2023). Children from socio-economically deprived families, single-parent households, and migrant backgrounds remain disproportionately affected, mirroring patterns reported across Europe and the WHO European Region (Grundy & Holt, 2001).

Socio-economic status (SES) is commonly operationalised through parental education, household income, and type of health insurance, each exerting direct and indirect effects on oral health (Grundy & Holt, 2001; Krieger et al., 1997). Lower SES can restrict financial as well as cognitive access to preventive services, fluoride products, and authoritative health information. In turn, material and behavioural pathways—diet quality, frequency of toothbrushing, parental monitoring, and dental attendance—mediate how SES translates into caries risk (Davey Smith et al., 1998; de Silva-Sanigorski et al., 2010).

High free-sugar consumption is a particularly potent driver: every additional daily exposure to sugar-sweetened snacks or beverages increases the odds of detectable caries in schoolchildren by 30–60% (Moores et al., 2022). The World Health Organization now recommends limiting free-sugar intake to less than 10% of total energy, ideally less than 5%, a target rarely met by German adolescents (Stowe et al., 2023). Beyond diet, lifestyle routines such as brushing with fluoridated toothpaste at least twice daily and attending preventive check-ups have repeatedly been shown to moderate SES-linked inequalities, yet adherence remains uneven (Acuña-González et al., 2022; Fernandez De Grado et al., 2018). Technological advances—from smart toothbrushes to mobile health reminders—hold promise, but robust evidence of their effectiveness in disadvantaged groups is still emerging.

Against this backdrop, the present retrospective cross-sectional study explores how DMFT scores vary with SES indicators, sugar intake, and oral-hygiene behaviours in a sample of 12- to 17-year-olds treated in a German private practice. By disentangling the relative contribution of each risk factor within a real-world setting, we aim to identify leverage points for tailored prevention. Such knowledge is essential for designing evidence-based interventions that narrow persistent oral-health disparities and help Germany reach the WHO 2030 target of reducing caries experience in children by at least 25% (Stowe et al., 2023).

# 2 Methods

This retrospective study analyzed data from children and adolescents treated at a dental referral practice in Erkelenz (Germany) between 2012 and 2022. Patients requiring specialized care were referred to an orthodontic practice in Heinsberg. The dataset comprised 76 participants aged 12–17 years who underwent routine dental examinations. All participants and/or their parents or legal guardians were informed about the use of their anonymized data for research and consented to participate.

Data were systematically retrieved from the practices' patient management systems. To ensure anonymity, each participant was assigned a unique identification code that replaced personal details in the final dataset. The following variables were extracted: *Patient_ID*,

a unique code to maintain anonymity and prevent any identification of individual participants; age and sex, where age (in years) was recorded at the time of examination and sex (male, female) was noted for demographic comparisons; body mass index (BMI), which was recorded using age- and sex-specific percentiles (e.g., normal, underweight, or overweight); parental education level, representing the highest education level (e.g., secondary school, vocational training, university) of both parents; household income, self-reported monthly net household income in euros, grouped into categories to assess socioeconomic status (SES); and the DMFT Index, representing the number of decayed (D), missing (M), and filled (F) permanent teeth (T) assessed according to standard clinical criteria. All permanent teeth were inspected and classified as intact, carious, missing, or filled, and the DMFT score was recorded at or near the initiation of treatment. Regarding lifestyle and dietary habits, data were collected on the frequency of sugar intake (e.g., times per day/week), oral hygiene practices (e.g., brushing frequency), and other habits (e.g., smoking, thumb-sucking). Medical history data included the presence or absence of specific systemic or oral diseases as documented in the patients' records. All data were transcribed into a password-protected spreadsheet, thoroughly reviewed for completeness, and coded for statistical analysis.

### 2.1 Statistics

Data were imported into SPSS Statistics version 18.0 (IBM Corp., Armonk, NY, USA) for cleaning and analysis. Continuous variables were assessed for normality using the Shapiro–Wilk test. Descriptive statistics included the mean ± standard deviation or the median and interquartile range (IQR), depending on the data distribution. Categorical variables were summarised as absolute frequencies ($n$) and relative frequencies (%). Comparisons between subgroups (e.g., differing socioeconomic groups) were made using the independent samples $t$-test or the Mann–Whitney $U$-test (for two groups) and the Kruskal–Wallis test (for more than two groups), as appropriate. Spearman's rank correlation was used to explore relationships between DMFT scores and continuous variables (e.g., frequency of sugar intake, parental education level). Statistical significance was set at $p < 0.05$ for all analyses. Box plots, pie charts, and bar charts were generated to visualise key findings, such as DMFT distributions across demographic and socioeconomic categories.

## 3 Results

### 3.1 Characteristics of the Study Population and Sociodemographic Variables

**Age and Sex Distribution** A total of 76 children and adolescents were included, comprising 47 females (61.8%) and 29 males (38.2%). The average age of the sample was $14.03 \pm 1.66$ years (range: 12–17 years). Females had a mean age of $14.09 \pm 1.68$ years, while males averaged $13.90 \pm 1.65$ years (**Figure 1, left**).

**Body Mass Index** Body Mass Index (BMI) was categorised as normal (10th–90th percentile), overweight (> 90th–97th percentile), or underweight (< 10th percentile). Most participants (89.5%, $n = 68$) had a normal BMI, whereas 7.9% ($n = 6$) were overweight and 2.6% ($n = 2$) were underweight (**Figure 1, right**).

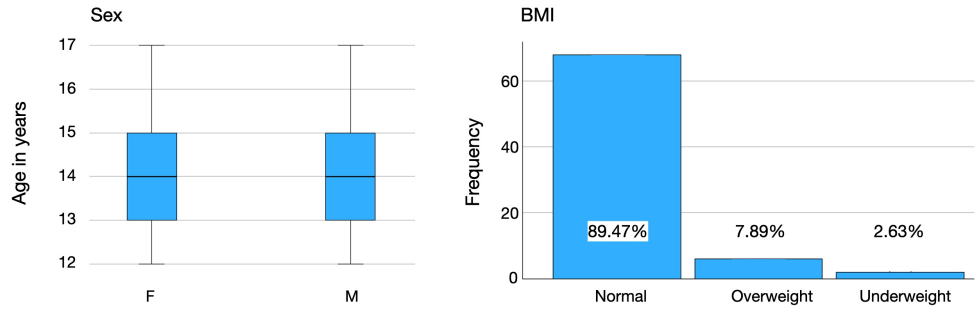


**Figure 1.** Age distribution (female / male) of the study population (left) and distribution of BMI categories (right).

**Parental Education** Information on mothers' and fathers' highest educational attainment provided insights into participants' sociodemographic backgrounds (**Figure 2**). For 47.4% ($n = 36$) of mothers and 50.0% ($n = 38$) of fathers, no information was available. Among mothers, 22.4% ($n = 17$) had completed vocational training, 18.4% ($n = 14$) held a university degree, and 11.8% ($n = 9$) had only finished school. The fathers' highest education followed a similar pattern: 26.3% ($n = 20$) vocational training, 18.4% ($n = 14$) university degree, and 5.3% ($n = 4$) school only.

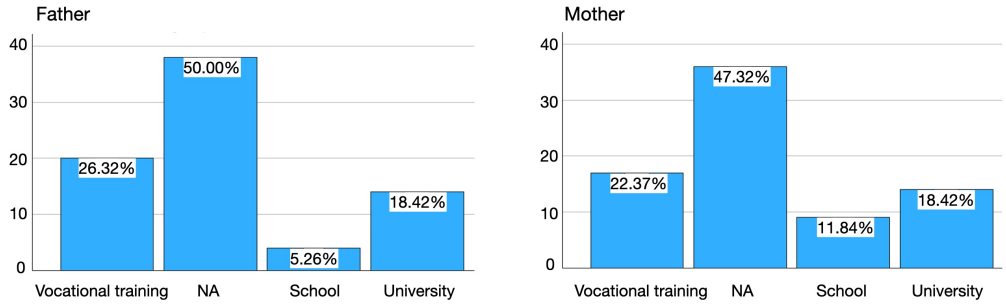


**Figure 2.** Highest level of education attained by parents. NA = no data available.

**Household Income** Only 25 participants (32.9%) reported monthly net household income data, with a mean of 3376 ± 1973.85 Euros (**Figure 3, left**). Due to the limited number of responses, these results should be interpreted with caution.

**Dentition Stage** Regarding dentition stage, 53.9% ($n = 41$) presented with fully permanent (adult) dentition, while 46.1% ($n = 35$) were still in the mixed (transitional) dentition stage.

**DMFT Index** Caries experience was assessed via the DMFT index (**Figure 3, right**). Overall, 28.9% ($n = 22$) had a DMFT of 0 (i.e., no detected caries, missing, or filled teeth), whereas 71.1% ($n = 54$) exhibited at least one affected tooth. Values between 2 and 6 were most common, although a small subset of participants showed markedly high DMFT indices (e.g., 13 or 19), reflecting severe caries burden.

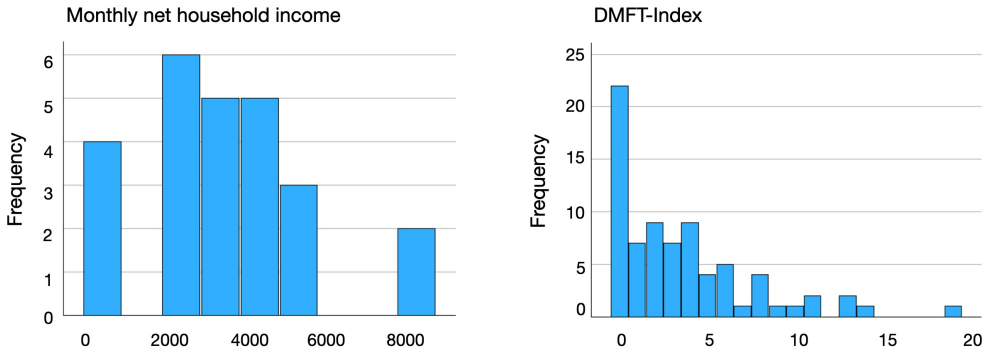


**Figure 3.** Left: Distribution of monthly net household income (n = 25). Right: Distribution of DMFT index.

## 3.2 Additional Findings and Behavioural Habits

**Habits** Most children and adolescents (90.8%; $n = 69$) reported no specific harmful oral habits such as bruxism, thumb-sucking, or mouth-breathing (Figure 4). The remaining participants presented with low frequencies of bruxism (3.9%), thumb-sucking (2.6%), teeth grinding (1.3%), or mouth-breathing (1.3%).

**Medical Conditions** The majority of participants (92.1%; $n = 70$) reported no chronic health conditions (Figure 9). Diabetes mellitus was the most commonly noted systemic disease (5.3%; $n = 4$).

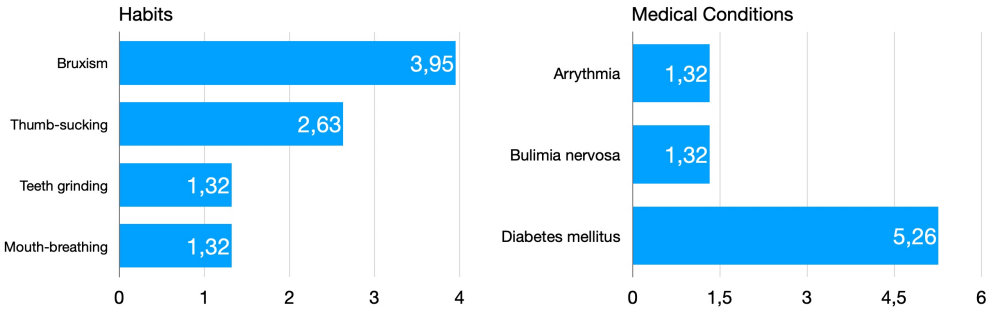


**Figure 4.** Distribution of oral habits (left) and chronic conditions (right) of the study population.

**Sugar Consumption** Frequent sugar intake (e.g., sweet snacks or beverages) was reported by 43.4% ($n = 33$), whereas 56.6% ($n = 43$) indicated low or no regular sugar consumption.

**Dietary Habits and Lifestyle Factors** Fast-food consumption was reported by 7.2% ($n = 7$), sugar-sweetened beverages by 6.6% ($n = 5$), and smoking by 5.3% ($n = 4$). Three-quarters (75.0%) of participants denied any unhealthy dietary or lifestyle practices.

**Oral Hygiene** Most participants (63.2%; $n = 48$) brushed their teeth twice daily, while 31.6% ($n = 24$) brushed once daily, and 5.3% ($n = 4$) brushed three times daily.

## 3.3 Association Between Sociodemographic Factors and DMFT Index

**Parental Education** Parental education level showed a distinct influence on the DMFT index (**Figure 5**). Children of mothers with a university degree had a notably lower mean DMFT of 0.50, whereas those whose mothers had only completed school reported a higher mean DMFT of 9.00. Similarly, paternal education followed the same trend: a university degree corresponded to a mean DMFT of 0.79, while a school-only background was associated with a mean DMFT of 11.75. Kruskal–Wallis tests indicated these differences were statistically significant ($p < 0.05$), underscoring the relationship between parental education and children's caries status.

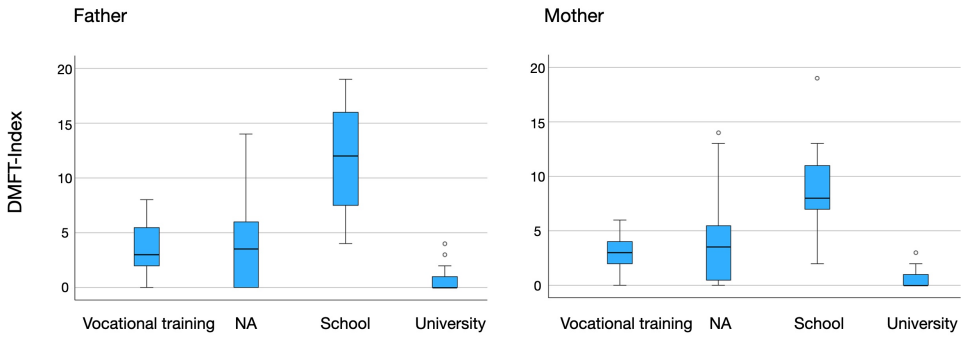


**Figure 5.** DMFT index by paternal and maternal education (NA = no data provided).

**Household Income** For those families reporting net household income ($n = 25$), Spearman's rank correlation revealed a statistically significant negative association ($r = -0.602$; $p = 0.001$) between income and DMFT (**Figure 6**). Higher income was linked to fewer carious, missing, or filled teeth.

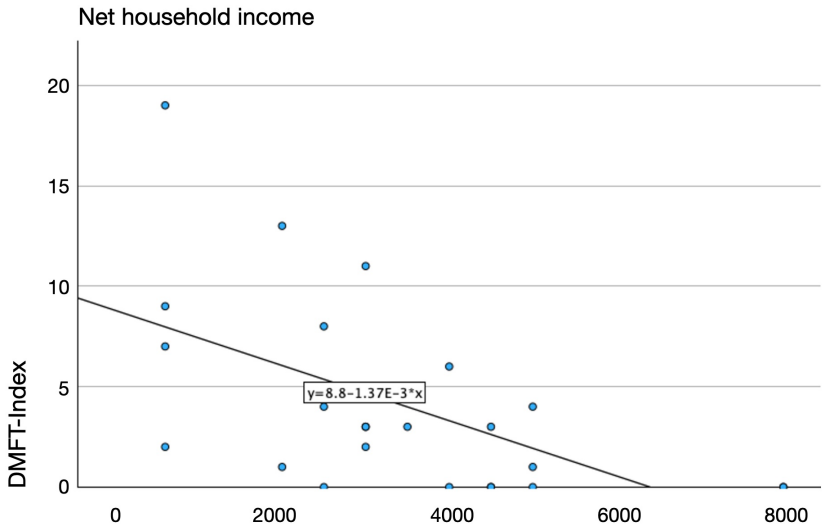


**Figure 6.** Correlation between DMFT index and monthly net household income (n = 25).

### 3.4 Association Between Dietary/Lifestyle Factors and DMFT Index

**Table 1** illustrates the strong effect of frequent sugar consumption on the DMFT index. Participants who consumed sugary foods or beverages regularly had a mean DMFT of 6.12 (SD 4.19), compared to a mean of 1.60 (SD 2.41) in those who rarely consumed sugar. Mann–Whitney U testing yielded a highly significant $p$-value ($< 0.0001$).

**Table 1.** Comparison of DMFT index by frequent sugar intake.

| FREQUENT SUGAR INTAKE | DMFT (MEAN) | SD | P-VALUE |
|---|---|---|---|
| Yes | 6.12 | 4.19 | < 0.0001 |
| No | 1.60 | 2.41 | |

**Table 2** summarizes additional patterns observed. High intake of fast food (mean DMFT: 7.71) and sugar-sweetened beverages (7.60) correlated with greater caries experience. Smoking was also linked to higher DMFT values (5.00). A Kruskal–Wallis test ($p = 0.006$) confirmed significant differences among these categories.

**Table 2.** DMFT index in relation to various dietary/lifestyle factors (NA: no data provided).

| DIETARY HABITS AND LIFESTYLE FACTORS | DMFT (MEAN) | SD |
|---|---|---|
| Fast Food | 7.71 | 5.85 |
| Sugary Soft Drinks | 7.60 | 5.27 |
| NA | 2.58 | 3.16 |
| Smoking | 5.00 | 3.46 |
| Sweets | 4.00 | 2.00 |
| p-Value | 0.006 | |

## 4 Discussion

Our study revealed a pronounced social gradient in dental caries among children and adolescents, with low socioeconomic status (SES) – indicated by lower parental education and household income – strongly associated with higher DMFT values. These findings closely mirror the patterns observed in the Sixth German Oral Health Study (DMS 6) and other literature. DMS 6, a nationally representative survey, documented that German youth now enjoy historically low average caries levels (mean DMFT $\approx 0.5$ at age 12, with 77.6% of 12-year-olds caries-free) (Jordan et al., 2025). However, DMS 6 also highlighted a "strong polarization" of disease in adolescents from less educated families, noting that social inequalities in oral health persist despite overall improvements (Jordan et al., 2025). In other words, much of the remaining caries burden is concentrated in socioeconomically disadvantaged groups – precisely the trend our practice-based study in Heinsberg corroborates.

Our findings align with the Sixth German Oral Health Study (DMS 6), which documented historically low average caries levels among German youth. However, DMS 6 also revealed a concerning "strong polarization" of disease, with adolescents from less educated families experiencing disproportionately more decay despite overall improvements in oral health. For example, we found that children of parents with low educational attainment had significantly higher DMFT scores than peers from higher-education households, mirroring DMS 6's findings. Likewise, household income emerged as a determinant of oral health in our cohort, consistent with broader evidence that children from socioeconomically deprived families suffer higher caries prevalence and severity than those from more affluent backgrounds (Dettori et al., 2024). This convergence between our local data and the national survey underlines that the social gradient in dental caries – whereby lower SES predicts poorer dental health – remains a critical issue both regionally and across Germany.

Notably, some differences in context and emphasis exist between DMS 6 and our study. DMS 6 primarily examined 12-year-olds as the adolescent reference group and found that caries experience in this age group has plateaued at a very low level nationally (Jordan et al., 2025). In fact, after decades of decline, no further drop in 12-year-old DMFT was seen in DMS 6 compared to the previous survey, suggesting that "the maximum has been reached" for caries reduction in this group (Jordan et al., 2025). Our study, by contrast, included a broader age range of children and adolescents in a clinical setting, which may capture the accumulation of caries into the mid-teens.

Caries is a cumulative disease, and epidemiologic data indicate that even between ages 12 and 15 there is a notable increase in caries experience as teeth are exposed to risk factors longer (Pitchika et al., 2020). For instance, one longitudinal observation in Germany found the mean caries burden (including non-cavitated lesions) quadrupled from about 1.8 affected surfaces at age 10 to 6.0 by age 15 (Pitchika et al., 2020). Thus, our inclusion of older adolescents likely yielded higher overall DMFT values than the 12-year-old snapshot of DMS 6. Indeed, many 15–17-year-olds in our practice had new carious lesions that would not have been counted at age 12.

Nonetheless, the relative pattern holds true: within our sample, as within DMS 6, adolescents from lower-SES families consistently bore the brunt of disease. Another contextual difference is that DMS 6, being a population survey, included many children who had never experienced caries (thanks to effective prevention nationally), whereas our data come from a dental practice population, inherently enriched for individuals seeking care (often for existing caries). This might slightly inflate the absolute caries levels observed in our study compared to the general population. However, it does not diminish the internal finding of an SES gradient; if anything, it underscores that even in an overall improved scenario, the remaining caries cases disproportionately involve children of lower social strata – a point emphasized by DMS 6 as well (Jordan et al., 2025). In sum, our practice-based findings are comparable to the national data in identifying SES-linked disparities, with minor expected differences due to age range and sampling (clinic vs. community). Both our study and DMS 6 point to educational attainment and income as pivotal influences on adolescent dental health outcomes.

DMS 6 offers less detail – particularly regarding specific dietary and lifestyle factors – our study provides additional insights by examining sugar consumption and other behaviors. DMS 6 did not report dietary habits, yet our results indicate that frequent sugar intake (e.g., high consumption of sweets and sugar-sweetened beverages) is a major contributor to higher DMFT. This is strongly supported by current scientific evidence. Caries is fundamentally a diet-mediated disease, and research consistently confirms that sugar exposure drives caries

risk (Dettori et al., 2024; Fidler Mis et al., 2017a). In our sample, children with high daily sugar intake (notably those drinking sugary drinks or frequent snacks) had substantially more carious lesions. This aligns with a Munich study which found that 10-year-olds consuming more sugar-sweetened beverages had significantly greater odds of having caries, even after adjusting for confounders (odds ratio $\approx 1.3$ per 250 ml daily portion) (Pitchika et al., 2020). By age 15 the association was somewhat attenuated (likely due to many teens already having some caries or protective factors like fluoride), but it remained observable (Pitchika et al., 2020).

### 4.1 Limitations

The present investigation has several noteworthy limitations. First, the sample was relatively small ($n = 76$) and drawn from a single private dental practice, which restricts statistical power and limits the generalizability of the findings to broader pediatric populations. Second, because the study was retrospective and cross-sectional, causal relationships between socioeconomic, dietary, and lifestyle factors and DMFT scores cannot be inferred. Third, considerable proportions of key variables—most notably parental education ($\approx 50\%$) and household income ($\approx 67\%$)—were missing, leading to further loss of power in subgroup analyses and raising the possibility of non-random (systematic) missingness. Fourth, reliance on self-reported dietary and oral-hygiene behaviors may have introduced recall and social-desirability bias, while the clinic-based setting could have produced selection bias by over-representing families who actively seek dental care. Finally, potential biological moderators such as fluoride exposure, salivary flow, and enamel defects were not measured, leaving residual confounding unaddressed. Together, these factors call for cautious interpretation of the results and underscore the need for larger, prospective, multi-center studies with more complete data capture to confirm and extend these findings.

## Conclusions

Our findings underscore that although overall pediatric dental health in Germany has substantially improved in recent decades, significant disparities remain, particularly among socioeconomically disadvantaged families. In line with data from the German Oral Health Study (DMS 6), children and adolescents whose parents have lower educational attainment and lower household incomes consistently exhibit higher *DMFT* values. This social gradient is further exacerbated by frequent sugar consumption and unhealthy lifestyle factors such as smoking. Targeted preventive interventions should focus on improving health literacy, reducing sugar intake, and facilitating routine dental check-ups in low-SES populations. By addressing the multifaceted nature of caries—combining universal measures with targeted approaches—oral health outcomes among children and adolescents in Germany can be optimized and existing inequalities narrowed.

### Acknowledgements

Not applicable.

### Ethical approval

Due to the retrospective nature of this analysis, which utilized anonymized patient records, formal approval from an ethics committee was not required. All included participants and/or

their legal guardians provided informed consent for the use of their data for research purposes. The study was conducted in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for cohort studies and complied with the Declaration of Helsinki and relevant local regulations. At no point during data collection or analysis was it possible to trace individual patient identities.

## Consent for publication

Not applicable.

## Authors' contributions

Gero Stefan Michael Kinzinger: Supervision, project administration, conceptualization, methodology, writing - original draft, Formal analysis. Brigitte Kirchmann: Investigation, writing - original draft, visualization. Jörg Alexander Lisson: Supervision, project administration, conceptualization, methodology, writing - review & editing.

## Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# References

Aarabi, G., Schenk, L., Kuhr, K., Borof, K., Jordan, A. R., & Lieske, B. (2025). Disease and care prevalence of people with migration history: Results of the 6th German Oral Health Study (DMS · 6). *Quintessence International, 56*, S120–S125. https://doi.org/10.3290/j.qi.b5981982

Acuña-González, G. R., Casanova-Sarmiento, J. A., Islas-Granillo, H., Márquez-Rodríguez, S., Benítez-Valladares, D., Mendoza-Rodríguez, M., de la Rosa-Santillana, R., Navarrete-Hernández, J. de J., Medina-Solís, C. E., & Maupomé, G. (2022). Socioeconomic inequalities and toothbrushing frequency among schoolchildren aged 6 to 12 years in a

multi-site study of Mexican cities: A cross-sectional study. *Children (Basel), 9*, 1069. https://doi.org/10.3390/children9071069

Broadbent, J. M., & Thomson, W. M. (2005). For debate: Problems with the DMF index pertinent to dental caries data analysis. *Community Dentistry and Oral Epidemiology, 33*, 400–409. https://doi.org/10.1111/j.1600-0528.2005.00259.x

da Silva, N. R. J., de Camargo, M. B. J., Dos Vaz, J. S., Correa, M. B., Matijasevich, A., da Silva Dos Santos, I., & Cascaes, A. M. (2023). Ultra-processed food consumption and dental caries in adolescents from the 2004 Pelotas Birth Cohort study. *Community Dentistry and Oral Epidemiology, 51*, 1180–1186. https://doi.org/10.1111/cdoe.12851

Davey Smith, G., Hart, C., Hole, D., MacKinnon, P., Gillis, C., Watt, G., Blane, D., & Hawthorne, V. (1998). Education and occupational social class: Which is the more important indicator of mortality risk? *Journal of Epidemiology and Community Health, 52*, 153–160. https://doi.org/10.1136/jech.52.3.153

de Silva-Sanigorski, A. M., Calache, H., Gussy, M., Dashper, S., Gibson, J., & Waters, E. (2010). The VicGeneration study–a birth cohort to examine the environmental, behavioural and biological predictors of early childhood caries: Background, aims and methods. *BMC Public Health, 10*, 97. https://doi.org/10.1186/1471-2458-10-97

Dettori, M., Arghittu, A., Cappai, A., Castiglia, P., Campus, G., & Children's Smiles Sardinian Group. (2024). Impact of socioeconomic inequalities on dental caries status in Sardinian children. *Children, 11*, 96. https://doi.org/10.3390/children11010096

Fernandez De Grado, G., Ehlinger, V., Godeau, E., Sentenac, M., Arnaud, C., Nabet, C., & Monsarrat, P. (2018). Socioeconomic and behavioral determinants of tooth brushing frequency: Results from the representative French 2010 HBSC cross-sectional study. *Journal of Public Health Dentistry, 78*, 221–230. https://doi.org/10.1111/jphd.12265

Fidler Mis, N., Braegger, C., Bronsky, J., Campoy, C., Domellöf, M., Embleton, N. D., Hojsak, I., Hulst, J., Indrio, F., Lapillonne, A., Mihatsch, W., Molgaard, C., Vora, R., Fewtrell, M., & ESPGHAN Committee on Nutrition. (2017a). Sugar in infants, children and adolescents: A position paper of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. *Journal of Pediatric Gastroenterology and Nutrition, 65*, 681–696. https://doi.org/10.1097/MPG.0000000000001733

Fidler Mis, N., Braegger, C., Bronsky, J., Campoy, C., Domellöf, M., Embleton, N. D., Hojsak, I., Hulst, J., Indrio, F., Lapillonne, A., Mihatsch, W., Molgaard, C., Vora, R., Fewtrell, M., & ESPGHAN Committee on Nutrition. (2017b). Sugar in infants, children and adolescents: A position paper of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. *Journal of Pediatric Gastroenterology and Nutrition, 65*, 681–696. https://doi.org/10.1097/MPG.0000000000001733

Glick, M., Williams, D. M., Kleinman, D. V., Vujicic, M., Watt, R. G., & Weyant, R. J. (2016). A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. *Journal of the American Dental Association, 147*, 915–917.

https://doi.org/10.1016/j.adaj.2016.10.001

Grundy, E., & Holt, G. (2001). The socioeconomic status of older adults: How should we measure it in studies of health inequalities? *Journal of Epidemiology and Community Health, 55*, 895.
https://doi.org/10.1136/jech.55.12.895

Jordan, A. R., Kuhr, K., Ohm, C., & Frenzel Baudisch, N. (2023). Methodology of the Sixth German Oral Health Study (DMS 6) to survey tooth and jaw misalignment. *Journal of Orofacial Orthopedics, 84*, 10–18.
https://doi.org/10.1007/s00056-022-00436-0

Jordan, A. R., Meyer-Lueckel, H., Kuhr, K., Sasunna, D., Bekes, K., & Schiffner, U. (2025). Caries experience and care in Germany: Results of the 6th German Oral Health Study (DMS · 6). *Quintessence International, 56*, S30–S39.
https://doi.org/10.3290/j.qi.b5986212

Krieger, N., Williams, D. R., & Moss, N. E. (1997). Measuring social class in US public health research: Concepts, methodologies, and guidelines. *Annual Review of Public Health, 18*, 341–378.
https://doi.org/10.1146/annurev.publhealth.18.1.341

Moores, C. J., Kelly, S. A. M., & Moynihan, P. J. (2022). Systematic review of the effect on caries of sugars intake: Ten-year update. *Journal of Dental Research, 101*, 1034–1045.
https://doi.org/10.1177/00220345221082918

Nadanovsky, P., & Sheiham, A. (1995). Relative contribution of dental services to the changes in caries levels of 12-year-old children in 18 industrialized countries in the 1970s and early 1980s. *Community Dentistry and Oral Epidemiology, 23*, 331–339.
https://doi.org/10.1111/j.1600-0528.1995.tb00258.x

Petrauskienė, S., Žemaitienė, M., Bendoraitienė, E. A., Saldūnaitė-Mikučionienė, K., Vasiliauskienė, I., Zūbienė, J., Andruškevičienė, V., & Slabšinskienė, E. (2023). A cross-sectional study of oral health status and behavioral risk indicators among non-smoking and currently smoking Lithuanian adolescents. *International Journal of Environmental Research and Public Health, 20*, 6609.
https://doi.org/10.3390/ijerph20166609

Pieper, K., Winter, J., Heinzel-Gutenbrunner, M., & Margraf-Stiksrud, J. (2019). Association between a new sugar index and caries experience: Results of a cross-sectional field study. *Caries Research, 53*, 160–167.
https://doi.org/10.1159/000486102

Pitchika, V., Standl, M., Harris, C., Thiering, E., Hickel, R., Heinrich, J., & Kühnisch, J. (2020). Association of sugar-sweetened drinks with caries in 10- and 15-year-olds. *BMC Oral Health, 20*, 81.
https://doi.org/10.1186/s12903-020-01068-9

Stowe, E. W., Moore, L. V., Hamner, H. C., Park, S., Gunn, J. P., Juan, W., Kantor, M. A., & Galuska, D. A. (2023). Meeting the Healthy People 2030 added sugars target. *American Journal of Preventive Medicine, 65*, 4–11.
https://doi.org/10.1016/j.amepre.2023.02.004