

Is the Significant Caries (SiC) Index in low-caries populations still significant?



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Introduction

In 2000, the Significant Caries Index (SiC Index) was introduced to describe individuals with the highest caries experience in epidemiology. SiC is calculated as mean DMFT among the third with the highest caries scores. By using DMFT, the SiC Index recognises a globally used and accepted measurement of caries experience. SiC Index aims at focusing the interest on the neglected and needy groups thus acknowledging oral health inequalities.

Aim

It was therefore the aim of this secondary analysis of German Oral Health Study data (Dritte and Vierte Deutsche Mundgesundheitsstudie, DMS III/IV):

- to investigate developments in caries inequalities between 1997 and 2005 in 12-year-olds in Germany, and
- to analyse whether the SiC Index is still a robust tool to describe the high caries risk fraction in general low-caries experience populations.

Patients and Methods

Study design

Secondary analysis

Data basis

Third German Oral Health Study (DMS III) conducted in 1997
 Fourth German Oral Health Study (DMS IV) conducted in 2005
 both studies are representative cross-sectional studies of oral health in the German resident population

Target study population

12-year-olds
 DMS III: n = 1.043 children
 DMS IV: n = 1.383 children

Calculated indices

DMFT: Decayed (D) + Missing (M) + Filled (F) Teeth (T) (Klein et al. 1938)
SiC: Individuals were sorted according to their DMFT values, and the one third of the population with the highest caries scores was selected. The mean DMFT for this subgroup was calculated (Brathall 2000).
Lorenz curve is a graphical representation of the cumulative distribution function of an empirical probability distribution. It was plotted by a function $C(f)$, where f , the cumulative portion of the population, was represented by the horizontal axis, and C , the cumulative portion of the total caries experience, was represented by the vertical axis (Lorenz 1905) (Fig. 1).
Gini coefficient is a measure of statistical dispersion to represent the inequality distributions of a population. This is the most commonly used measure of inequality. The Gini coefficient is defined as a ratio of the areas on the Lorenz curve diagram calculated by the area marked A divided by the sum of the areas marked A and B (Fig. 1). The coefficient varies between 0 which reflects complete equality, and 1 which indicates complete inequality (Gini 1912).

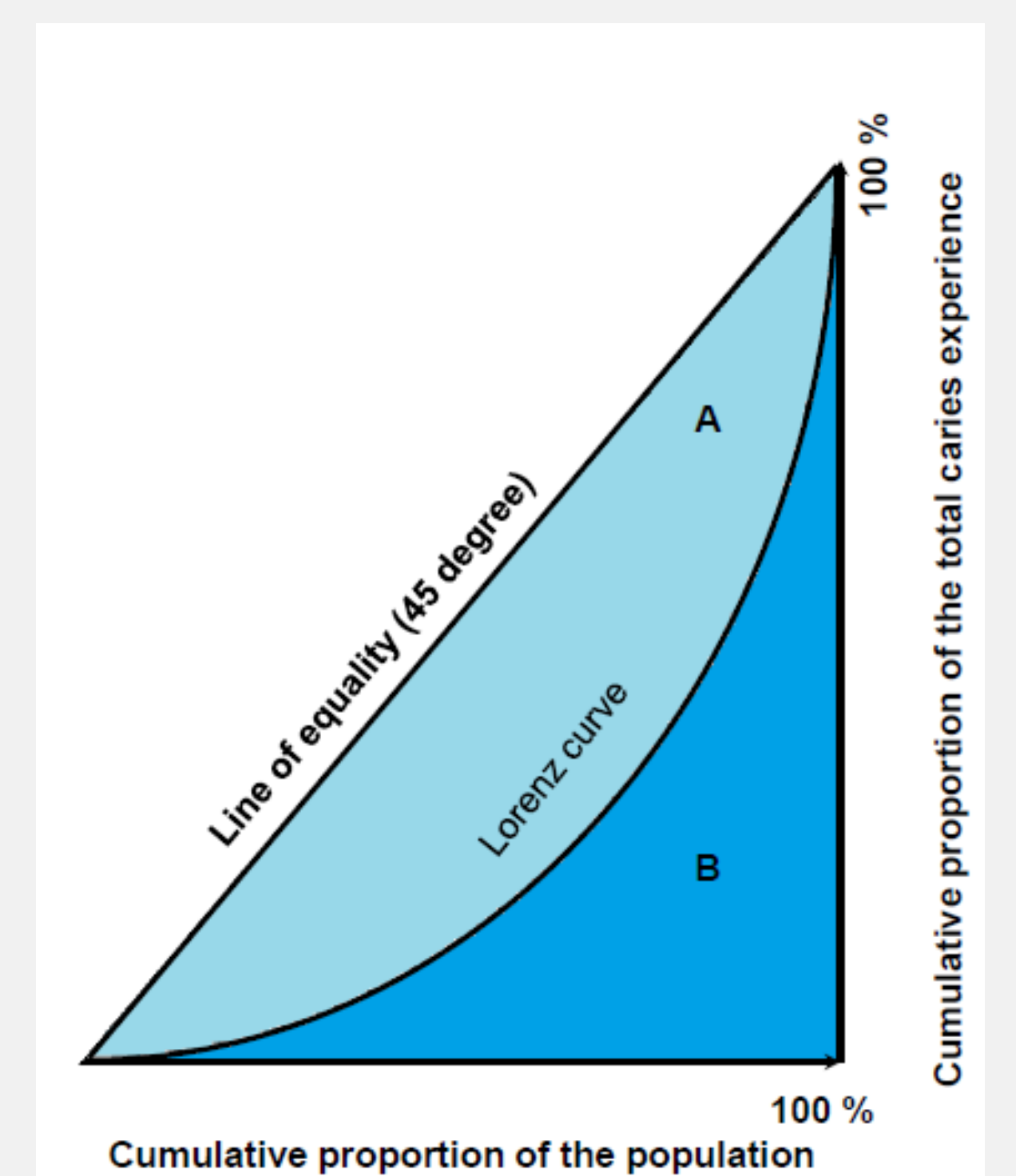


Figure 1: Graphical illustration of the Lorenz curve and Gini coefficient

Lorenz curve: On the graph, the straight diagonal line represents perfect equality of caries distribution; the Lorenz curve lies beneath it, showing the reality of caries distribution.

Gini coefficient: The graph shows that the Gini coefficient is equal to the area marked A divided by the sum of the areas marked A and B, that is $Gini = A / (A + B)$. The Gini coefficient lies between 0 and 1.



Results

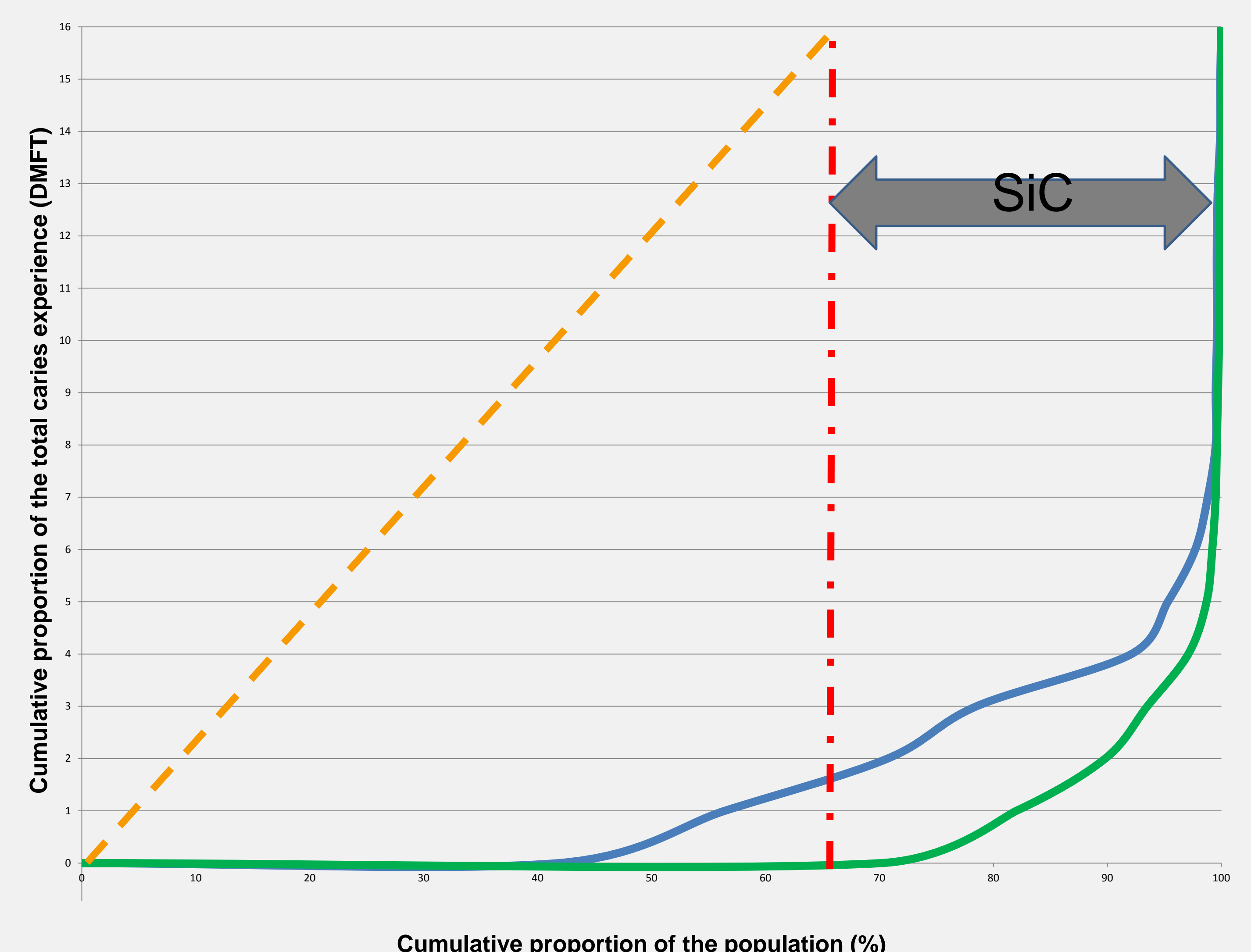
Table 1: Absolute numbers and proportions of DMFT values in 12-year-olds in DMS III and DMS IV

DMFT	DMS III (1997)	DMS IV (2005)
	Absolute numbers; effective / cumulative proportion(%) of population	
0	436; 41.8 / 41.8	969; 70.1 / 70.1
1	151; 14.5 / 56.4	164; 11.9 / 82.0
2	146; 14.0 / 70.7	109; 7.9 / 89.8
3	85; 8.2 / 78.5	51; 3.7 / 93.5
4	142; 13.6 / 92.1	51; 3.7 / 97.1
5	33; 3.2 / 95.3	22; 1.6 / 98.7
6	25; 2.4 / 97.7	6; 0.5 / 99.2
7	12; 1.1 / 98.8	4; 0.3 / 99.5
8	7; 0.7 / 99.5	2; 0.1 / 99.6
9	0; - / 99.5	1; 0.1 / 99.7
10	2; 0.2 / 99.6	2; 0.2 / 99.8
11	0; - / 99.6	1; 0.1 / 99.9
12	0; - / 99.6	0; - / 99.9
13	1; 0.1 / 99.7	0; - / 99.9
14	2; 0.2 / 99.9	1; 0.1 / 100.0
15	0; - / 99.9	0; - / 100.0
16	1; 0.1 / 100.0	0; - / 100.0

Table 2: Clinical caries characteristics and calculated indices of 12-year-olds in DMS III and DMS IV

12-year-olds	DMS III (1997)	DMS IV (2005)
Data in parentheses: 95 % confidence interval		
Caries free	41.8 %	70.1 %
Mean DMFT	1.7 (1.6; 1.8)	0.7 (0.6; 0.8)
SiC Index	4.1 (3.9; 4.3)	2.1 (0.0; 2.3)
Gini coefficient (total)	0.61	0.81
Gini coefficient (SiC)	0.20	0.42

Figure 2: Caries experience Lorenz curves for 12-year-olds in:
 DMS III (1997) 
 DMS IV (2005) 
 showing an increasing proportions of the population without caries experience but also increasing health inequalities.



Conclusion

Though DMFT and SiC Index declined between DMS III and IV, the Gini coefficients increased over time. On the one hand these results indicate a general benefit of caries prevention in 12-year-olds including high risk individuals. On the other hand the Gini coefficient demonstrated increasing caries inequalities. In DMS IV, even caries-free subjects were part of the SiC Index demonstrating that in low-caries populations SiC might not set a meaningful cut-off to describe the high risk fraction.

Literature: Brathall 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: 378-84
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COI: The German Oral Health Studies (DMS) were realized by the Institute of German Dentists and proudly financed by the German dental profession via the German Dental Association and the National Association of Statutory Health Insurance Dentists.

