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## Dental care behaviour in Switzerland

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#### SUMMARY

Improvements in oral health are changing the requirements for oral health care provision. This study assessed the frequency and major reason of dental visits and personal oral hygiene measures in Switzerland, and temporal trends in visit frequency. The number of dental visits in the previous twelve months, the reason for these visits, and the prevalence of oral hygiene measures were quantified from weighted data from the 2012 Swiss Health Survey. The frequency of dental visits in 2012 was compared with previous surveys (1992–2007). Almost two thirds of subjects reported visiting a dentist and almost half had visited a dental hygienist in the previous twelve months. Voluntary (33%) or recall check-ups (25%) were the most common reasons for the last dental visit across age groups. Treatment needs including caries/filling/endodontic treat-

ment (10%), crowns/FDP/RDP/implants (8%), toothache (5%), extraction (5%), periodontal complaints (2%), or orthodontic appliances (2%) were more heterogeneously distributed across age groups. One in ten subjects had dental implants; prevalence increased with increasing age as did the number of missing teeth. Use of interdental cleaning devices and frequent tooth brushing were more common among subjects with few or no missing teeth and among subjects with higher versus lower income or education. Oral health awareness varied with a higher awareness in women than in men and in subjects with higher versus lower income or education. The prevalence of dental implants and dental hygienist's visits has increased in Switzerland since 2002, but oral hygiene measures remained stable.

## Introduction

Oral health status has improved over the past decades in many industrialised countries: the number of missing teeth and particularly the number of edentulous subjects has been decreasing (MÜLLER ET AL. 2007; WENNSTRÖM ET AL. 2013), and the proportion of individuals with functional dentition (at least 20 remaining teeth) into old age is increasing. With average life expectancy increasing, the percentage of older people within the populations has increased. These demographic changes and the improvements in oral health status result in changing requirements for oral health care provision (HUGOSON ET AL. 2005; BROCKLEHURST & MACEY 2015). In Europe, dentists are increasingly supported in the provision of care by non-dentist oral health care workers such as dental hygienists, and the ratio of non-dentist oral health care workers to dentists has increased in the past decades (WIDSTROM ET AL. 2010; BROCKLEHURST & MACEY 2015).

Dental caries and periodontal disease are still the main reasons for tooth loss and require adequate treatment provision (GONDA ET AL. 2013). The reasons for dental visits and the frequency of visits vary across countries and are influenced by many factors such as age, socio-economic status, and presence of health care insurances covering for costs, all of which may change over time (HOLM-PEDERSEN ET AL. 2005; VIRTANEN ET AL. 2007; STADELMANN ET AL. 2012).

Since 1992, information about health care utilisation and health-related behaviours of the Swiss population has been collected every five years as part of the Swiss National Health Survey conducted by the Swiss Federal Office for Statistics (BUNDESAMT FÜR STATISTIK 2014). More detailed questions on oral health are included every ten years (1992, 2002, 2012), including details of visits to the dental hygienist. Previous studies have demonstrated improvements in oral health over time with decreasing numbers of missing teeth and a reduced frequency of removable dental restorations (ZITZMANN ET AL. 2008; MENGHINI ET AL. 2010; STADELMANN ET AL. 2012; SCHNEIDER ET AL. 2017). In 2002, most dental visits were made for check-ups and, in the older population, for the maintenance of existing restorations (STADELMANN ET AL. 2012).

The aim of the present study was to assess the frequency of dental visits, the reason for dental visits, and personal oral hygiene measures in Switzerland in 2012. The study also compared the frequency of dental visits recorded in 2012 with that from previous national surveys.

## Methods

### Data and study population

Participants in the Swiss National Health Survey had to be at least 15 years old at the time of the interview to take part in the survey. The questionnaire was provided in one of three native languages (German, French, or Italian). The main part of this study is based on data from the most recent assessment in 2012, in which a representative sample of 41,008 private households was approached for participation. 21,597 participants took part in an initial telephone interview and 18,357 persons filled in an additional written questionnaire. Our analysis was restricted to subjects who answered at least the questions on dental visits, missing teeth and prosthetic dental restorations, with the final study population including 17,784 persons in 2012. The analysis assessing the temporal trend of dental visits also used the data from the former surveys (1992, 1997, 2002, and 2007).

## Outcome

The relevant questions for defining the variables of interest of the analyses were: “When have you seen a dentist the last time (<1 year, 1–2 years, >2 years, never)?”, and “How often have you seen a dentist or a dental hygienist in the past 12 months?”. In 1992 and 1997, subjects were only asked how often they visited the dentist, while in the subsequent surveys, they were asked separately for the number of visits to a dentist and to a dental hygienist. In 2012, participants were asked in detail for the reason of their last dental visit (personal motivation/volunteered for a check-up, recalled for a check-up, caries/filling/endodontic treatment, tooth extraction, crown/fixed dental prosthesis [FDP]/removable dental prosthesis [RDP]/implants including prosthesis repair, periodontitis, orthodontic appliances, toothache, or other reasons). In addition, they were asked how often they brushed their teeth or cleaned their removable restorations (“less than once a day”, “once daily”, “twice a day” or “more than twice a day”) and what measures were used for cleaning (manual toothbrush, electric toothbrush, dental floss/toothpick, other). Subjects could indicate all different dental care methods that applied, therefore, percentages of frequencies do not add up to 100%.

## Exposure

To describe dental visits by sociodemographic and behavioural factors, the following factors were considered: the socio-economic status of participants was assessed by the report of the highest achieved level of education and the total household income. Education was categorised as university degree (tertiary education), general education or training on the job (secondary education), compulsory school (primary education or in training) or no compulsory/unknown education (no education/unknown). Total household income per month was weighted by the number of subjects living in a household to define income (household equivalence income). Income quartiles were defined as low (<2,857 CHF), low-middle (2,857–3,999 CHF), middle (4,000–5,332 CHF) and high (≥5,333 CHF). For the categorisation into rural/urban, the cut-off was set at a population of at least 10,000 people or a group of communities close together with at least 20,000 people. Body mass index (BMI in kg/m<sup>2</sup>) was calculated from self-reported height and weight and categorised into five groups: <18.5, 18.5–24.9, 25.0–29.9, ≥30.0, unknown. Smoking status was categorised into the following four groups: non-smokers, ex-smoker, current smoker and unknown. Subjects were furthermore grouped according to the number of missing teeth with the following categories: no missing teeth, 1–2, 3–8, 9–27 missing teeth, or edentulous for those with 28 missing teeth.

## Statistical analysis

Descriptive analyses were used to calculate the prevalence of dental visits in the last twelve months stratified by sociodemographic factors, numbers of missing teeth, and type of dental restoration. To test the overall effects of the listed factors, Wald Log-Linear Chi-Square tests were performed, if possible. In addition, the reason for the most recent dental visit and the distribution of oral hygiene measures in percent were described, also stratified by sociodemographic and oral health-related factors. All analyses were weighted with regard to age, gender, residential area, and nationality to provide representative results for the Swiss non-institutionalised population (BUNDESAMT FÜR

STATISTIK 2013). The statistical analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC, USA).

## Results

### Dental visits in the last year and changes since 1992

In the 2012 Swiss Health Survey, 74.7% of the population aged 15–74 years reported to have visited the dentist or dental hygienist at least once in the past twelve months. Women reported such visits more often than men (78.2% versus 71.2%), and this pattern had been observed in the previous surveys as well (Fig. 1). Stratifying by type of visit a decrease in visits to the dentist was observed from 1992 to 2012 from 67.1% to 60.3% in men and from 73.2% to 65.3% in women, whereas the percentage of visits to the hygienist increased from 34.7% in 2002 to 46.6% in 2012 in men, and from 41.1% to 56.0% in women.

About one in seven of the total population (including those  $\geq 75$  years) had their recent visit to the dentist or dental hygienist three or more years ago. Two thirds of all subjects visited a dentist or dental hygienist in the previous year, the percentage was slightly higher in women (68.0%) than in men (64.5%) and increased with increasing income or education (Tab. I). More than a third (36.4%) of the subjects had not visited the dentist in the past twelve months and almost half (47.9%) of the subjects had not visited a dental hygienist in the past twelve months (Tab. II). Among the subjects who had consulted a dentist at least once during the past twelve months, about a third (32.9%) reported two or more consultations. Among the subjects who had consulted a dentist at least once during the past 12 months, the percentage of subjects with two or more consultations varied slightly with age in a U-shaped form: the 35- to 44-year-olds had the lowest percentage of two or more consultations (24.5%), while the highest percentage (approx. 41%) was observed among the  $\geq 65$ -year-olds. Percentages in men and women were similar. Among those, two or more consultations, indicating a more complex treatment, were more frequent in subjects with lower income (lowest quartile: 36.8%; highest quartile: 30.9%) or lower education (compulsory education: 41.9%; tertiary education:

27.8%). It also increased with the number of missing teeth, from 26.4% in subjects with no missing teeth to 53.1% in edentulous subjects.

Among the subjects who had visited a dental hygienist at least once during the past twelve months, about a fifth had two or more consultations, the percentage increased with increasing age – except for the  $\geq 75$ -year-olds – from 13.0% for the  $< 25$ -year-olds to 33.6% for the 65- to 74-year-olds. Among those, the percentage of subjects with two or more dental hygienist consultations varied slightly among subjects with different dentitions: subjects with 3–8 missing teeth had the highest percentage of two or more consultations (27.5%) compared to approximately 17% of subjects with no missing teeth and edentulous subjects.

### Reason for the last dental appointment in 2012

The most often indicated reasons for the last visit to the dentist were voluntary check-ups (33.2%) or recall check-ups (24.8%) across all age groups (Tab. III). The proportion of check-ups (voluntary or recall) amongst all consultations was slightly less than two thirds for the younger and middle-aged subjects and decreased to less than 50% in the oldest age groups. Other reasons indicating treatment needs comprised caries/filling/endodontic treatment (10.5%), crown/FDP/prosthesis/implant (7.7%), tooth extraction (5.4%), toothache (4.7%), orthodontic appliances (1.9%), or periodontal complaints (1.8%). These reasons were more heterogeneously distributed across age groups. Orthodontic appliances were the third most mentioned reason for the last visit to the dentist in the youngest age group, while for the 25- to 54-year-olds caries was the third-most mentioned reason. For the 55- to 64-year-olds, caries (11.2%) and prosthetic dental restorations (12.0%) shared the third position, while for the  $\geq 65$ -year-olds, prosthetic dental restorations accounted for the third most common stated reason for dentist consultations. Percentages for tooth extraction were similar for the different age groups with the highest percentage for the 75- to 84-year-olds, while toothache was indicated least frequently in the oldest age groups.

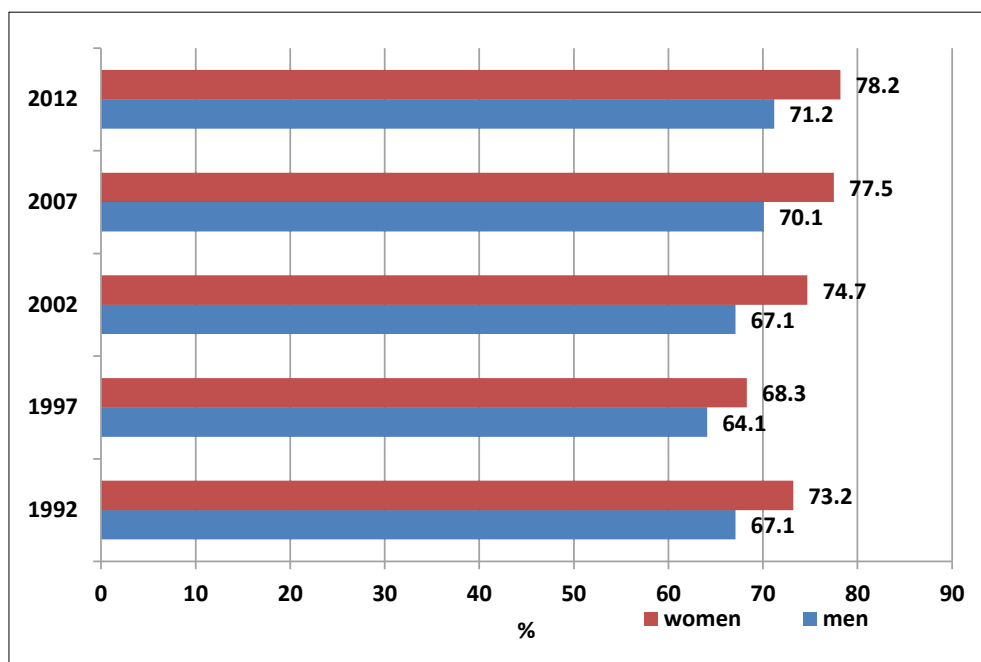


Fig. 1 Visits to the dentist or dental hygienist in the last twelve months in the population aged 15–74, stratified by gender, 1992–2012

<b>Tab.1 Time since last dental visit, stratified by sociodemographic or oral health-related factors (weighted %)</b>				
	<b>&lt;1 year (%)</b>	<b>1–2 years (%)</b>	<b>≥ 3 years (%)</b>	<b>Never (%)</b>
<b>All</b>	<b>66.3</b>	<b>18.1</b>	<b>14.3</b>	<b>1.1</b>
<b>Age (in years)**</b>				
< 25	66.7	20.8	11.6	0.9
25–34	59.5	21.3	18.0	1.1
35–44	64.6	20.0	14.2	1.1
45–54	69.2	16.6	13.3	0.9
55–64	70.6	15.6	12.8	0.8
65–74	69.3	14.5	14.2	1.3
75–84	65.5	15.9	15.3	2.6
≥ 85	55.1	19.0	21.8	1.5
<b>Gender**</b>				
Men	64.5	17.6	16.5	1.2
Women	68.0	18.6	12.0	1.0
<b>Nationality**</b>				
Swiss	67.5	18.0	13.4	0.9
Non-Swiss	62.2	18.7	17.2	1.7
<b>Residential area</b>				
Urban	66.0	18.2	14.5	1.1
Rural	67.0	17.8	13.5	1.2
<b>BMI (in kg/m<sup>2</sup>)**</b>				
< 18.5	68.0	19.2	12.3	0.4
18.5–24.9	67.0	18.9	13.2	0.9
25.0–29.9	66.0	16.8	15.3	1.5
≥ 30.0	62.8	17.3	18.1	1.5
Unknown	57.9	23.2	16.6	1.4
<b>Smoking**</b>				
Non-smoker	68.0	18.0	12.6	1.1
Ex-smoker	67.4	16.9	14.2	1.2
Current smoker	62.4	19.3	17.2	1.0
<b>Tooth brushing**</b>				
≥ 2 per day	68.6	17.5	12.8	0.9
< 2 per day	56.5	20.8	20.5	1.9
<b>Missing teeth**</b>				
0	65.4	19.3	13.7	1.4
1–2	70.1	17.3	12.0	0.4
3–8	70.1	16.9	12.6	0.4
9–27	62.7	16.1	19.1	1.4
Edentulous	28.1	15.2	48.1	6.4
Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis				
* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.				
** Wald Log-Linear Chi-Square P value < 0.05				

**Tab. I** Time since last dental visit, stratified by sociodemographic or oral health-related factors (weighted %)

continued

	< 1 year (%)	1–2 years (%)	≥ 3 years (%)	Never (%)
<b>PDR*</b>				
No	62.0	19.9	16.5	1.5
RDP	56.7	16.7	23.3	2.4
FDP	74.6	16.3	8.8	0.2
Implant	76.7	16.1	7.1	0.0
<b>Income (in CHF)**</b>				
<2857	60.8	17.9	18.2	2.7
2857–3999	66.9	17.9	14.1	0.8
4000–5332	64.8	19.8	14.6	0.6
≥5333	71.0	17.5	11.0	0.4
<b>Education**</b>				
Compulsory	62.6	17.8	16.6	2.5
Secondary	66.0	18.4	14.5	0.9
Tertiary	68.6	18.0	12.7	0.6

Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis  
 \* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.  
 \*\* Wald Log-Linear Chi-Square P value < 0.05

**Tab. II** Number of visits to the dentist or dental hygienist within the last twelve months (weighted %)

	<b>Number of visits</b>									
	0		1		2		> 2		Unknown	
	D	DH	D	DH	D	DH	D	DH	D	DH
<b>All</b>	<b>36.4</b>	<b>47.9</b>	<b>42.7</b>	<b>40.9</b>	<b>11.8</b>	<b>9.4</b>	<b>8.8</b>	<b>1.4</b>	<b>0.4</b>	<b>0.4</b>
<b>Age (in years)</b>										
<25	35.1	67.6	41.8	28.1	11.0	3.1	12.0	1.0	0.2	0.1
25–34	44.6	56.4	39.5	36.7	9.3	5.7	6.1	0.9	0.4	0.4
35–44	39.6	45.3	45.6	45.7	8.5	7.8	6.2	1.1	0.1	0.1
45–54	34.7	39.9	46.9	48.7	10.8	9.7	7.4	1.4	0.3	0.3
55–64	31.5	38.5	42.6	45.3	14.9	13.7	10.6	2.2	0.3	0.4
65–74	31.6	42.3	40.3	38.3	15.2	16.9	12.5	2.1	0.3	0.4
75–84	33.5	45.6	38.8	38.2	16.9	13.2	9.6	1.6	1.1	1.4
85+	43.0	53.9	32.1	33.1	15.6	10.1	7.3	0.9	2.0	2.0
<b>Gender</b>										
Men	38.8	52.4	41.0	36.5	11.8	9.3	8.0	1.5	0.4	0.4
Women	34.1	43.4	44.3	45.2	11.7	9.6	9.5	1.4	0.3	0.4
<b>Nationality</b>										
Swiss	35.4	44.5	44.4	43.9	11.4	9.9	8.6	1.3	0.3	0.3
Non-Swiss	40.0	59.0	37.2	31.0	12.9	7.8	9.4	1.7	0.5	0.5

Abbreviations: BMI: body mass index; D: dentist, DH: dental hygienist; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis  
 \* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.  
 Wald Log-Linear Chi-Square P value < 0.05 for all characteristics listed above.

Tab. II Number of visits to the dentist or dental hygienist within the last twelve months (weighted %)										
continued										
Number of visits										
0		1		2		>2		Unknown		
D	DH	D	DH	D	DH	D	DH	D	DH	
<b>Residential area</b>										
Urban	36.7	46.5	41.8	41.3	12.3	10.2	8.9	1.6	0.3	0.3
Rural	35.7	51.7	45.3	39.7	10.2	7.3	8.4	0.8	0.5	0.5
<b>BMI (in kg/m<sup>2</sup>)</b>										
<18.5	38.5	53.0	39.5	36.5	11.0	8.5	10.9	1.7	0.1	0.2
18.5–24.9	35.7	46.5	44.5	42.7	11.1	9.0	8.5	1.4	0.3	0.3
25.0–29.9	36.3	47.2	41.9	40.5	12.8	10.4	8.6	1.5	0.4	0.4
≥30.0	40.2	55.2	36.5	34.4	12.5	8.8	10.0	0.8	0.8	0.8
Unknown	37.8	57.3	35.6	25.3	14.5	11.1	10.6	4.8	1.5	1.5
<b>Smoking</b>										
Non-smoker	34.5	47.0	45.7	42.4	11.0	9.1	8.4	1.2	0.3	0.3
Ex-smoker	36.1	43.0	41.5	43.3	13.8	11.1	8.1	1.9	0.6	0.7
Current smoker	40.1	53.2	38.3	36.4	11.5	8.8	9.9	1.4	0.2	0.2
<b>Tooth brushing</b>										
≥2 per day	34.3	44.4	44.2	43.5	12.1	10.2	9.1	1.6	0.3	0.3
<2 per day	45.3	62.2	36.6	30.1	10.3	6.3	7.4	0.9	0.5	0.5
<b>Missing teeth</b>										
0	38.3	48.1	45.5	42.8	10.0	8.0	5.9	0.8	0.4	0.4
1–2	33.9	42.3	43.1	43.8	13.3	11.8	9.5	2.0	0.2	0.2
3–8	30.0	45.6	39.8	39.1	15.3	12.1	14.6	2.7	0.3	0.4
9–27	36.7	57.6	36.8	31.9	12.8	8.5	13.3	1.5	0.4	0.5
Edentulous	70.6	85.8	13.8	10.2	6.6	1.7	7.3	0.4	1.7	1.9
<b>PDR*</b>										
No	41.8	52.8	42.7	39.1	9.0	6.8	6.1	0.9	0.4	0.4
RDP	42.6	59.1	32.2	29.9	13.3	8.4	11.1	1.6	0.9	1.0
FDP	27.1	37.7	46.5	46.8	14.9	13.4	11.4	1.9	<0.1	0.1
Implants	29.7	40.7	38.5	42.7	16.3	12.8	15.2	3.5	0.2	0.2
<b>Income (in CHF)</b>										
<2857	42.3	58.0	36.0	32.9	10.8	7.1	10.2	1.1	0.7	0.8
2857–3999	35.3	50.9	43.6	40.0	12.4	7.8	8.4	0.9	0.4	0.5
4000–5332	37.7	45.5	43.7	44.3	10.8	8.6	7.7	1.4	0.2	0.2
≥5333	31.8	38.3	47.1	46.1	12.7	13.4	8.3	2.2	0.1	0.1
<b>Education</b>										
Compulsory	38.9	62.4	34.9	28.6	13.1	6.4	12.1	1.5	1.0	1.1
Secondary	36.5	47.7	42.7	41.3	11.9	9.4	8.7	1.2	0.3	0.4
Tertiary	35.0	40.5	46.9	46.7	10.9	11.1	7.2	1.7	0.0	<0.1
Abbreviations: BMI: body mass index; D: dentist, DH: dental hygienist; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis										
* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.										
Wald Log-Linear Chi-Square P value <0.05 for all characteristics listed above.										

**Tab. III** Reason for most recent dental visit in 2012, stratified by sociodemographic and oral health-related factors (weighted %)

	Check-up voluntary	Check-up recall	Caries/filling/endodontic treatment	Tooth extraction	Crown/FDP/implant/prosthesis	Periodontal complaints	Orthodontic appliance	Toothache	Other	Not asked (no recent visit)	Unknown (no answer)
<b>All</b>	<b>33.2</b>	<b>24.8</b>	<b>10.5</b>	<b>5.4</b>	<b>7.7</b>	<b>1.8</b>	<b>1.9</b>	<b>4.7</b>	<b>4.4</b>	<b>1.1</b>	<b>4.4</b>
<b>Age (in years)</b>											
<25	31.1	30.6	6.6	6.6	1.3	0.7	9.4	3.6	5.9	0.9	3.4
25–34	39.6	21.6	11.8	5.3	2.8	1.7	2.4	5.3	5.4	1.1	2.8
35–44	39.5	23.2	12.3	4.7	4.2	2.1	0.3	6.4	3.4	1.1	2.8
45–54	35.1	25.8	11.5	4.1	7.2	2.2	0.1	5.5	4.4	0.9	3.3
55–64	27.9	24.7	11.2	5.8	12.0	2.0	0.2	4.9	4.4	0.8	6.1
65–74	27.5	24.0	9.8	5.1	16.3	2.1	0.4	3.5	3.9	1.3	6.2
75–84	24.0	24.5	8.5	8.3	16.0	1.3	0.9	2.2	2.8	2.6	9.0
≥85	24.5	18.9	8.2	5.2	18.8	1.0	2.2	0.7	5.4	1.5	13.6
<b>Gender</b>											
Men	31.5	26.4	11.2	5.9	8.0	1.4	1.8	5.2	4.0	1.2	3.4
Women	35.0	23.2	9.9	5.0	7.3	2.1	2.0	4.3	4.8	1.0	5.5
<b>Nationality</b>											
Swiss	31.3	29.0	10.1	4.8	7.5	1.7	1.8	4.3	4.5	0.9	4.2
Non-Swiss	39.5	11.0	12.0	7.4	8.3	2.2	2.2	6.4	4.3	1.7	5.0
<b>Residential area</b>											
Urban	33.5	23.7	10.7	5.4	7.9	1.9	1.9	4.8	4.7	1.1	4.5
Rural	32.6	27.9	10.0	5.5	6.9	1.5	1.8	4.6	3.7	1.2	4.4
<b>BMI (kg/m<sup>2</sup>)</b>											
<18.5	37.4	21.4	9.0	5.3	4.9	1.5	6.3	3.9	5.5	0.4	4.5
18.5–24.9	34.7	25.4	10.5	5.0	6.1	1.9	2.5	4.5	4.5	0.9	4.0
25.0–29.9	31.9	24.8	10.8	5.2	10.0	1.5	0.7	4.8	4.1	1.5	4.6
≥30.0	28.1	22.3	10.5	8.4	10.6	1.9	0.5	6.2	4.4	1.5	5.5
Unknown	24.2	25.1	7.0	9.0	7.5	0.0	3.7	4.4	7.5	1.4	10.2

Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis

\* RDP, FDP; implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.

**Tab. III** Reason for most recent dental visit in 2012, stratified by sociodemographic and oral health-related factors (weighted %)

	Check-up voluntary	Check-up recall	Caries/filling/ endodontic treatment	Tooth extraction	Crown/FDP/ implant/ prosthesis	Periodontal complaints	Orthodontic appliance	Toothache	Other	Not asked (no recent visit)	Unknown (no answer)
<b>Smoking</b>											
Non-smoker	34.9	26.9	9.8	4.6	6.2	1.3	2.2	4.2	4.1	1.1	4.7
Ex-smoker	30.1	25.2	10.9	5.2	11.1	2.6	0.7	4.3	4.2	1.2	4.5
Current smoker	32.7	20.6	11.4	7.1	7.7	1.9	2.3	6.0	5.3	1.0	4.0
<b>Tooth brushing</b>											
>2 per day	34.1	25.5	10.1	4.8	7.5	1.7	1.9	4.5	4.5	0.9	4.4
<2 per day	29.6	21.6	12.2	7.8	8.4	2.0	1.8	5.9	4.2	1.9	4.5
<b>Missing Teeth</b>											
0	38.4	27.9	10.4	2.9	3.1	1.4	2.6	3.9	4.9	1.4	3.2
1-2	30.2	24.3	12.8	8.0	7.0	1.4	0.8	6.5	3.8	0.4	4.7
3-8	29.4	19.8	11.5	8.6	11.2	3.0	1.5	5.8	3.7	0.4	5.1
9-27	20.3	21.0	4.9	7.5	24.8	2.3	1.0	4.2	4.1	1.4	8.4
Edentulous	11.8	8.9	0.3	6.4	39.6	3.1	2.4	1.3	5.8	6.4	14.0
<b>PDR*</b>											
No	37.5	26.4	10.7	5.8	0.4	1.6	2.9	4.7	4.9	1.5	3.5
RDP	21.5	18.1	5.3	7.6	26.3	2.0	1.4	2.8	3.7	2.4	8.8
FDP	30.8	24.8	12.1	4.3	12.1	1.8	0.4	5.3	3.9	0.2	4.4
Implants only	31.9	22.7	9.0	4.1	11.4	3.1	3.0	5.6	5.2	0.0	4.0
<b>Income (in CHF)</b>											
<2857	27.6	19.7	11.2	8.2	8.4	1.5	3.0	5.2	5.3	2.7	7.3
2857-3999	32.3	25.4	10.2	6.2	7.8	2.0	2.2	5.0	4.9	0.8	3.2
4000-5332	33.8	26.5	11.2	4.4	7.0	2.0	1.4	5.1	3.8	0.6	4.0
>5333	38.3	27.1	9.8	3.4	7.6	1.6	0.7	3.9	4.0	0.4	3.3
<b>Education</b>											
Compulsory	27.6	19.0	9.4	8.0	9.2	1.8	6.2	4.2	5.6	2.5	6.6
Secondary	31.9	26.0	10.1	5.8	7.4	1.9	1.4	5.4	4.4	0.9	4.7
Tertiary	38.5	25.8	11.9	3.2	7.4	1.4	0.5	3.9	3.9	0.6	2.8

Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis

\* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.

continued



The percentage of voluntary check-up decreased with increasing age, to about 24% in the oldest age groups. Visits for crown/FDP/prosthesis/implant treatments were more frequently reported in older subjects as the reason for the last dental visit, representing 18.8% of the dental visits for the  $\geq 85$ -year-olds. This pattern was even more pronounced when the reason for the last dental visit was stratified by the number of missing teeth: voluntary check-ups decreased from 38.4% in subjects without missing teeth to 11.8% in edentulous subjects, whereas reconstructive treatment needs increased from 3.1% to 39.6%. The oldest age group and the edentulous subjects were also the groups who most frequently did not provide a reason for their last dental visit (13.6% and 14.0%). Voluntary and recall check-ups were more frequently indicated by subjects with tertiary education (38.5% and 25.8%) or higher income (38.3% and 27.1%) than by subjects with compulsory education (27.6% and 19.0%) or low income (27.6% and 19.7%).

### Orthodontic appliances and implants

Orthodontic appliances were reported to be currently or previously worn by 28.4% of the population. They had been most frequently used by the youngest subjects (53.5% for the 15- to 24-year-olds), whereas only 3.5% in the oldest age group had ever worn an orthodontic appliance. Women indicated the use of orthodontic appliances slightly more often than men with 30.1% versus 26.6%. They were also more frequently used by subjects with higher income or education: while a third of the subjects in the highest income group indicated the usage of orthodontic appliances, only 22.7% in the lowest income group did so. There was also an association with BMI: obese subjects indicated the usage of orthodontic appliances less frequently than lighter subjects: 15.1% in obese versus 33.5% in normal-weight subjects. There was almost no difference between subjects living in a rural or an urban setting.

Restorations with implants had been indicated by 9.8% of the population in 2012. The prevalence of implants increased from 1.2% in the youngest age group to 22.1% for the 75- to 84-year-olds and amounted to still 16.2% in the oldest age group ( $\geq 85$ -year-olds). Dental implants were slightly more prevalent in the highest income quartile (12.3%) compared to the other three income quartiles, in which the prevalence ranged between 8.1% and 9.1%. Implants were also more prevalent in subjects with tertiary education (11.3%) than in patients with primary education (7.1%), among Swiss (10.3%) compared to non-Swiss (8.4%), and in the urban (10.4%) compared to the rural setting (8.4%). Implants were least frequently indicated by underweight subjects (6.2%) compared to normal weight (9%), overweight (11.5%) and obese subjects (10.4%). Among patients with 1-2 missing teeth, 13.4% indicated having an implant compared to 16.0% with 3-8 missing teeth and 18.1% with 9-27 missing teeth.

### Personal oral hygiene measures

The majority (77.6%) of subjects brushed their teeth with a manual toothbrush, 33.9% indicated using an electric toothbrush (Tab. IV). Half of the population also used dental floss or toothpicks to clean the interproximal regions and 8.0% indicated using other – not further specified – dental care methods. Electric toothbrushes were most often used by the middle-aged (35- to 64-year-olds) and almost twice as often by subjects with tertiary education compared to subjects with compulsory education. The percentage of electric-toothbrush usage also increased with increasing income from 23.8% among subjects in the lowest income quartile to 43.5% in the highest income quartile. The usage of dental floss or toothpicks was also higher in subjects with higher income or education, in normal-weight subjects (52.5%) compared to overweight (48.6%) or obese (43.7%) subjects and in women (59.3%) than men (41.4%). Subjects who reported brushing their teeth more

**Tab. IV** Personal oral hygiene measures (weighted %)

	Manual toothbrush (%)	Electric toothbrush (%)	Dental floss or toothpick (%)	Other (%)
<b>All</b>	<b>77.6</b>	<b>33.9</b>	<b>50.4</b>	<b>8.0</b>
<b>Age (in years)</b>				
<25	87.1	21.5	30.7	5.1
25-34	79.8	32.6	46.9	6.7
35-44	76.0	39.3	53.0	6.9
45-54	74.1	38.6	59.1	7.8
55-64	73.4	38.6	59.3	9.6
65-74	72.9	36.5	52.8	11.6
75-84	80.6	24.2	47.2	10.2
$\geq 85$	91.1	17.6	36.6	10.3
<b>Gender</b>				
Men	76.4	33.4	41.4	6.6
Women	78.7	34.4	59.3	9.3
Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis				
* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.				

<b>Tab. IV</b> Personal oral hygiene measures (weighted %) <span style="float: right;">continued</span>				
	<b>Manual toothbrush (%)</b>	<b>Electric toothbrush (%)</b>	<b>Dental floss or toothpick (%)</b>	<b>Other (%)</b>
<b>Nationality</b>				
Swiss	77.7	34.2	52.1	8.4
Non-Swiss	77.0	33.0	44.9	6.7
<b>Residential area</b>				
Urban	76.4	35.3	51.1	8.4
Rural	80.7	30.0	48.5	6.7
<b>BMI (kg/m<sup>2</sup>)</b>				
<18.5	82.3	33.4	51.1	8.8
18.5–24.9	78.8	33.9	52.5	7.8
25.0–29.9	74.9	35.2	48.6	8.2
≥30.0	77.1	30.2	43.7	8.0
Unknown	73.6	31.0	53.4	10.6
<b>Smoking</b>				
Non-smoker	79.6	32.4	51.6	7.9
Ex-smoker	73.1	38.7	54.4	9.9
Current smoker	77.5	32.8	45.5	6.6
<b>Tooth brushing</b>				
≥2 per day	78.3	35.0	54.3	8.4
<2 per day	74.7	29.5	34.4	6.3
<b>Missing teeth</b>				
0	77.8	34.6	50.0	7.0
1–2	74.0	39.0	59.6	8.1
3–8	76.9	34.9	52.6	9.1
9–27	86.7	18.3	34.5	9.7
Edentulous	83.1	6.7	1.8	15.3
<b>PDR*</b>				
No	80.0	31.7	46.4	6.4
RDP	84.9	19.4	30.9	10.4
FDP	72.0	41.4	62.1	9.6
Implants	72.9	39.0	56.8	7.2
<b>Income (in CHF)</b>				
<2857	84.3	23.8	40.9	7.0
2857–3999	79.3	30.8	48.8	6.9
4000–5332	75.9	36.8	53.7	7.7
≥5333	71.3	43.5	57.6	9.7
<b>Education</b>				
Compulsory	85.3	21.1	34.4	5.7
Secondary	78.3	33.3	51.1	8.3
Tertiary	72.1	41.9	57.9	8.7
Abbreviations: BMI: body mass index; FDP: fixed dental prosthesis; PDR: prosthetic dental restorations; RDP: removable dental prosthesis				
* RDP, FDP, implant restorations are mutually exclusive groups, i.e. the implant category refers to subjects who have only implants and no other type of restoration.				

frequently also reported dental floss or toothpick usage more often (54.3% versus 34.4%). The usage of dental floss or toothpicks was highest in subjects with 1–2 missing teeth (59.6%) compared to 50.0% in subjects with no missing teeth, 52.6% in subjects with 3–8 missing teeth, and 34.5% in subjects with 9–27 missing teeth. Among subjects with no missing teeth, 82.5% reported frequent tooth brushing which reduced to 73.7% in subjects with 9–27 missing teeth.

## Discussion

The current study analysed frequency and major reasons of dental visits and personal oral hygiene measures in 2012 in Switzerland and demonstrated a good preventive oral health awareness in the population, with almost two thirds of subjects visiting their dentist at least once a year and almost half visiting a dental hygienist. The oral health awareness varied across sociodemographic groups with higher awareness in women than men and in subjects from higher than lower educational or income levels. The overall pattern of dental care behaviour was similar to the observations made in 2002. The most frequent reason for dental visits were voluntary or recall check-ups; implant restorations were present in every tenth subject and in more than every fifth subject in the oldest age group.

The results from this study are largely representative for the Swiss population, but inherit a certain selection by including only participants contactable by telephone and only those who were able to speak one of three Swiss official languages. This bias may be most pronounced in the oldest age groups because healthier elderly participants were probably more likely to participate in the survey than more fragile elderly subjects. To reduce this bias, the Swiss Health Survey allowed the interview of a proxy person from the same household answering the questionnaire on behalf of the sampled subject.

Women were more likely to have visited the dentist or dental hygienist in the previous twelve months than men, a pattern which was consistent in all five surveys. Women also reported slightly more often periodontal complaints and the usage of orthodontic appliances than men. The additional use of interproximal oral hygiene measures such as dental floss or toothpicks was also more prevalent in women. Women's higher practices of preventive oral care in terms of check-up visits and oral hygiene has already been reported in the Swiss survey of 2002 and was also observed in other countries such as Finland, Greece, or Japan (SAKKI ET AL. 1998; FUKAI ET AL. 1999; PAOLA CODA BERTEA 2007; STADELMANN ET AL. 2012; MAMAI-HOMATA ET AL. 2016). However, this higher oral health awareness in women does not seem to translate into a better oral health status, as the number of missing teeth was similar or even higher in women than in men. The reasons for this are not completely understood (PAOLA CODA BERTEA 2007; STADELMANN ET AL. 2012; SCHNEIDER ET AL. 2017).

The modification of the telephone questionnaire in 2012 to include a separate indication for dental hygienist's visits may have introduced a slight imprecision that affected comparisons of the percentages of dental consultation across the different surveys. It also highlights a possible limitation of our study: the use of self-reported information. The differentiation between visits to the dentist and dental hygienist is important when analysing trends in dental care provision in the population because they show opposing trends: the visits to the dentist decreased slightly over the years, while the visits to the dental

hygienist increased and the combination of both point to a small increase in oral health care utilisation in Switzerland between 1992 and 2012. These observations indicate a trend towards a more specialised and tailored approach in oral health care provision, which was previously outlined by the increasing ratio of dentist to non-dentist oral health care workers in other European countries (WIDSTROM ET AL. 2010; BROCKLEHURST & MACEY 2015).

The percentage of subjects visiting a dentist within the previous twelve months was higher in the highest income quartile compared to the lowest income quartile, and when comparing the reason for the last dental visits, the percentage of subjects indicating voluntary or recall check-ups was lower in the lowest income quartile than in the highest income quartile. Whether these differences in health care utilisation were also associated with differences in clinical outcomes, was beyond the scope of this study. In Europe, dental health care coverage is differently regulated: while in some countries it is covered by general health insurances, in others, such as Switzerland, subjects have to get special insurance or have to cover most of the costs themselves. Associations between income and oral health care use have already been reported in previous studies in Switzerland (GUESSOUS ET AL. 2012; STADELMANN ET AL. 2012; BODENMANN ET AL. 2014). A population-based study in Geneva using survey information from the years 2007–2012 reported a 10.6% prevalence of forgoing dental care for economic reasons which was highly income-dependent, ranging from 2.4% in the highest income group to 23.5% in the lowest income group (GUESSOUS ET AL. 2012; BODENMANN ET AL. 2014; GUESSOUS ET AL. 2014). Associations between income, insurance coverage for dental care, and dental health care utilisation have also been reported in other countries. In the USA, a recent study demonstrated a decrease in dental health care utilisation between 2001 and 2010, particularly in lower income groups or uninsured subjects (KENNEY ET AL. 2012; WALL ET AL. 2012; VUJICIC & NASSEH 2014). In Austria, where about 50% of dental services is paid out of pocket, a study investigating socio-economic determinants of out-of-pocket expenditure for dental services in 2009/2010 found a higher probability for out-of-pocket expenditures for dental services in higher income groups (SANWALD & THEURL 2016).

Compared to 2002, the overall pattern for the reason of the most recent visit to the dentist was similar, with the most frequent reasons being voluntary and recall check-ups, which are not necessarily motivated by dental treatment needs (STADELMANN ET AL. 2012). Surprisingly, periodontal complaints were the least frequently mentioned reason for dental visits in 2002 and 2012 (STADELMANN ET AL. 2012). These results are in contrast to recent clinical examinations of the periodontal status in Germany, which demonstrated that even though the prevalence of periodontal disease had decreased since 2005, still more than half (52%) of the 35- to 44-year-olds and 65% of the 65- to 74-year-olds were affected in 2013/14 (JORDAN 2016). According to the 2009–2012 US National Health and Nutrition Examination Survey (NHANES) which is based on clinical investigations, the prevalence of subjects with periodontitis amongst the adult US population  $\geq 30$  years old reached 46%, with 9% having severe periodontitis (EKE ET AL. 2015). As periodontal complaints such as gingivitis and periodontitis usually do not present with acute symptoms until an advanced stage, and subjects could only indicate one reason for the last visit, periodontal complaints were possibly hidden behind other answers such as voluntary and

recall check-ups. The need for regular professional care by a dental hygienists seems to be understood by the majority of the population.

The use of dental implants had increased during recent years and amounted to 3.2% in 2002, while in 2012, one in ten subjects had an implant restoration (SCHNEIDER ET AL. 2017). Differences in implant prevalence existed with age, number of missing teeth and educational status, but differences across income quartiles were small. The German survey (DMS V) revealed that 3.4% of 35- to 44-year-olds and 8.1% of 65- to 74-year-olds had received dental implants; this percentage in 2014 was 10 times higher than in 1997 (JORDAN 2016). According to the Swedish register of community health care clinics, implant prevalence reached 2.5% in 2014/15 and was highest amongst the  $\geq 70$  years old subjects (6%) (SKAPA 2015).

In conclusion, the current study demonstrated that almost two thirds of the Swiss population visited a dentist and almost half a dental hygienist at least once a year, mainly for check-ups, but with differing reasons across age and sociodemographic factors. Women were more likely to follow oral health care recommendations than men. The prevalence of dental implants and the visits to a dental hygienist increased in the population since 2002, whereas the pattern of oral hygiene measures was similar to the observations made in 2002.

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## Author contributions

Study concept and design: Schneider, Zemp, Zitzmann

Acquisition, analysis or interpretation of data: Schneider, Zemp, Zitzmann

Drafting of the manuscript: Schneider

Critical revision of the manuscript for important intellectual content: Zemp, Zitzmann

Statistical analysis: Schneider, Zemp, Zitzmann

Administrative, technical, or material support: Schneider

Study supervision: Zemp, Zitzmann

## Conflict of interests

CS: No conflicts of interest.

NZ: No conflicts of interest.

EZ: No conflicts of interest.

## Zusammenfassung

### Einleitung

Während der letzten Jahrzehnte haben Verbesserung der Mundgesundheit stattgefunden, die mit Veränderungen in der zahnärztlichen Versorgung assoziiert sind. Das Ziel der vorliegenden Studie war es, die Häufigkeit und die Gründe für die zahnärztlichen Besuche zu analysieren und über die letzten Jahrzehnte zu vergleichen. Darüber hinaus wurden die Zahnputzgewohnheiten untersucht.

### Material und Methoden

Gewichtete Daten der letzten Schweizer Gesundheitsbefragung aus dem Jahre 2012 dienten der Quantifizierung der Anzahl zahnärztlicher Besuche im Jahr vor der Befragung. Der Grund der Konsultation und die Häufigkeit der persönlichen Mundhygienemassnahmen wurden erfasst. Die Daten früherer natio-

nalener Befragungen aus den Jahren 1992 bis 2007 dienten der Verlaufsanalyse.

## Resultate

In der Bevölkerung zwischen 15 und 74 Jahren stieg der Anteil der Personen, die den Zahnarzt oder die Dentalhygienikerin aufgesucht haben, von 70% (1992) auf 75% im Jahr 2012. Dabei lag die Häufigkeit des Zahnarztbesuchs bei fast zwei Dritteln, während fast die Hälfte der Bevölkerung in den zurückliegenden zwölf Monaten bei der Dentalhygienikerin waren. In allen drei Befragungen der letzten 20 Jahre war die Häufigkeit bei Frauen höher als bei Männern. Der am häufigsten genannte Grund der zahnärztlichen Konsultation war in allen Altersgruppen die Kontrolle aus eigener Initiative (33%) oder aufgrund des zahnärztlichen Aufgebots (25%). Die anderen Gründe waren heterogen verteilt über die verschiedenen Altersgruppen und bezogen sich auf zahnärztliche Therapien. Innerhalb der Gesamtbevölkerung wurde Karies/Füllung/Wurzelkanalbehandlung von 10% genannt, Zahnschmerzen und Zahnextraktionen von je 5%, prothetische Massnahmen von 8% (Krone/Brücke/Prothese/Implantat/Prothesenreparatur), Zahnfleischbeschwerden (Parodontitis) von 2% und Zahnstellungskorrekturen (Zahnspange) von 2%. 78% der Bevölkerung gaben an, die Zähne mit einer Handzahnbürste zu reinigen, 34% verwendeten eine elektrische Zahnbürste. Diese Anwendung der elektrischen Zahnbürste oder zusätzlicher Hygienehilfsmittel war in der Bevölkerung mit höherer Ausbildung oder höherem Einkommen bis zu zweimal so häufig als in tieferen Ausbildungs- oder Einkommenschichten. Eine von zehn Personen gab an, dentale Implantate zu haben, dabei stieg diese Häufigkeit mit höherem Alter und mit der Anzahl fehlender Zähne. Die Verwendung interdentaler Mundhygienehilfsmittel war bei Personen mit vollständiger Dentition oder wenigen fehlenden Zähnen am häufigsten.

## Diskussion

Das Bewusstsein bezüglich Mundhygiene variierte in den verschiedenen soziodemografischen Gruppen, wobei bei Frauen im Vergleich zu Männern und bei Personen mit höherem Einkommen oder Ausbildungsstand im Vergleich zu tieferem Einkommen oder Ausbildungsstand ein höheres Bewusstsein zu finden war. Die Häufigkeiten dentaler Implantate sowie der Besuche bei der Dentalhygienikerin stiegen gegenüber der Befragung im Jahr 2002 an, während die angegebenen Mundhygienemassnahmen kaum Veränderungen zeigten.

## Résumé

### Introduction

Des améliorations dans la santé orale amènent à des changements dans les provisions des soins de santé bucco-dentaire. Cette étude a déterminé la prévalence des visites dentaires ainsi que leurs raisons et leur tendance temporelle en Suisse. En plus, la fréquence des mesures d'hygiène dentaire des individus a été saisie.

### Matériel et méthodes

Le nombre des visites dentaires dans les douze mois précédents, leurs raisons et la fréquence des mesures d'hygiène dentaire ont été quantifiés avec les données pondérées de l'enquête de santé suisse de 2012. La prévalence des visites dentaires de 2012 a été comparée aux prévalences des enquêtes précédentes (1992–2007).

## Résultats

À peu près deux tiers des personnes ont indiqué des visites auprès des dentistes et presque la moitié auprès des hygiénistes dentaires durant les douze mois précédant l'enquête. Dans tous les groupes d'âge, les raisons de ces visites indiquées le plus fréquemment étaient visite volontaire (33 %) ou visite de contrôle (25 %). Les besoins de traitement incluaient: caries dentaires/plombage/traitement endodontique (10 %), couronnes/prothèses fixes/prothèses amovibles/implants (8 %). La fréquence de maux de dents (5 %), des extractions (5 %), de symptômes parodontaux (2 %) ou d'applications orthodontiques était distribuée de façon plus hétérogène à travers les groupes d'âge. Une personne sur dix avait des implants dentaires dont la pré-

valence augmentait avec l'âge et avec le nombre de dents manquantes. L'utilisation d'instruments de nettoyage interdentaire ainsi que le brossage régulier des dents étaient plus fréquents chez les personnes sans dents manquantes et les personnes avec une éducation haute ou des revenus comparativement hauts.

## Discussion

La conscience vis-à-vis de la santé orale était plus prononcée chez les femmes que chez les hommes et chez les personnes avec une éducation haute ou des revenus comparativement hauts. La prévalence des implants dentaires ainsi que les visites chez des hygiénistes dentaires ont augmenté en Suisse depuis 2002, pendant que l'hygiène buccale est restée stable.

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