

Dental service utilisation among adults in a European developing country: findings from a national health survey

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Background: The objective was to estimate the frequency of visits to a dentist and to assess the impact of determinants on dental care utilisation among adults in the Republic of Srpska (RS), Bosnia and Herzegovina. **Methods:** We conducted a cross-sectional study using data from the 2010 National Health Survey performed in the RS. A total of 4,128 adults (≥ 18 years) were interviewed in their homes. Multivariate logistic regression was used to assess the relationship between demographic characteristics, socio-economic characteristics, health behaviours, self-rated health, self-reported noncommunicable diseases (NCDs) and dental care utilisation. **Results:** Only 20% of all respondents reported a visit to a dentist in the year preceding the interview. Younger respondents (OR = 0.97), women (OR = 1.30–1.39), urban dwellers (OR = 1.41–1.61), those who were employed (OR = 1.20) and those who self-reported NCDs (OR = 1.32–1.33) more frequently utilised dental services. The opposite was true for those in the low wealth index group (OR = 0.79), persons with a low (OR = 0.31) and middle (OR = 0.48) level of education and people who self-rated their health as average (OR = 0.76–0.80). **Conclusion:** The present study revealed a low frequency of visits to a dentist, especially for preventive oral health care. It also confirmed demographic, socio-economic and health-related differences in dental-care utilisation in RS. To minimise those differences, systemic approaches aimed at increasing access to dental care could be an important step. Oral health-promotion policies need to be adopted in the RS.

Key words: Oral health, dental services, socio-economic status, adults, Republic of Srpska

INTRODUCTION

Poor oral health is an important public health problem because of its increasing incidence and prevalence worldwide, especially in low- and middle-income countries, with the greatest burden being on disadvantaged and socially marginalised populations^{1,2}. Timely and appropriate utilisation of dental health care is vital for the prevention and treatment of oral diseases; therefore, it is necessary to identify those factors which act as facilitators or barriers to utilisation. The frequency and determinants of dental-care service utilisation have been the subject of many research studies worldwide^{3–7}. However, until now there has been no published research on dental service utilisation in the Republic of Srpska (RS), one of two constitutional and legal entities of Bosnia and Herzegovina (BH), a middle-income country in Southeastern Europe.

Dental health care in the RS is organised at primary and secondary health-care levels and is provided by both public and private sectors. The provision of dental care at the primary health-care level covers full care for children aged 0–18 years and emergency care for adults and is mainly organised by the public sector. Dental care provided by the private sector includes full care financed by out-of-pocket payments. In 2015, about two-thirds (65.9%) of visits in the private sector and one-third (34.6%) of visits in the public sector were for treatment reasons. Preventive check-ups were performed at almost half (47.2%) of all visits in the public sector and less frequently (25.5%) in the private sector⁸. In the same year there were 49 dentists per 100,000 population in RS, the lowest rate in the EU⁹.

The aim of this research was to estimate the frequency of dental visits and to assess the impact of

determinants on dental care utilisation among adults in the RS, especially regarding socio-economic characteristics. In addition, we assessed the main reasons for use and non-use of dental services.

METHODS

Study population

We used cross-sectional data on the adult population (18 years and over) from the National Health Survey conducted in 2010 in the RS, BH, described in detail elsewhere¹⁰. A two-stage, stratified cluster sampling approach was used for selection of the survey sample. The first-stage units were enumeration districts stratified according to type of settlement (urban or rural) and geographical region, and households were the second-stage units. Of 4,673 adults who were identified in 1,779 randomly selected households, 4,128 were interviewed (response rate = 88.3%).

Information on demographic characteristics, socio-economic characteristics, health behaviours, self-rated health, self-reported non-communicable diseases (NCDs), as well as information on utilisation of dental services, was collected in participants' homes using a questionnaire.

This study was conducted in accordance with the tenets of the Declaration of Helsinki. Written informed consent was obtained from all participants. The study protocol and the consent procedure were approved by the Ethics Committee of the Institute of Public Health of Republic of Srpska, BH.

Study variables

The following demographic variables were selected for analysis in the present study: age, type of settlement (urban or rural), and marital status (living with a partner or single). Education (low, medium, high), employment status [employed, unemployed or economically inactive (retired persons, housewives, students, persons inactive for family reasons, ill people, persons unable to work, elderly subjects)] and wealth index group (low, middle, high) were selected as socio-economic variables. The wealth index (demographic and health survey wealth index), a composite survey-specific measure of a household's living standard, is a commonly used indicator of socio-economic status (SES) in low- and middle-income countries. Variables included in the wealth index calculation were related to a household's possession of the following assets: colour TV, cellular phone, computer, internet access, refrigerator, dishwasher, washing machine, air conditioning and car; and dwelling characteristics such as material used for floor, roof and walls, type of drinking water

source, toilet and sanitation facilities, source of energy used for heating and number of bedrooms per household member. More information about calculation of the participants' wealth index is detailed elsewhere¹¹.

Health behaviour variables were: smoking status (non-smoker, current smoker, former smoker), physical activity (poor, average, good), body mass index (BMI) and fruit and vegetable consumption. Participants were classified, according to BMI, into three groups: normal weight, overweight or obese. For fruit and vegetable consumption, dummy variables were constructed according to daily usage (use and non-use). Self-rated health was measured using an individual's perception of his or her own health (poor, average, good). The presence of NCD was determined using the following question: 'Have you had any of the following diseases or conditions in the previous 12 months?' Self-reported NCDs were myocardial infarction, stroke, hypertension, malignant tumours, diabetes mellitus, arthrosis and degenerative joint disease.

Details about the mentioned independent variables are summarised elsewhere¹².

The dependent variable was a visit to a dentist (use and non-use of a dental health-care service) in the year preceding the survey.

Dentate respondents were also requested to report the main reason for their last visit to a dentist by choosing one of the following options: 'control/preventive check-up/consultation', 'dental treatment', 'tooth extraction', 'denture' and 'periodontitis'. In addition, they were asked the reasons for non-use of dental health-care services and were allowed to choose more than one answer from the following options: 'no need', 'not enough time', 'long waiting on services', 'insufficient financial resources', 'no trust in dentist', 'long distance to dentist' and 'other reasons'.

Statistical analysis

The data were presented as frequencies and percentages. Logistic regression analyses (univariate and multivariate) were conducted to determine significant associations between demographic characteristics, socioeconomic characteristics, health behaviours, self-rated health and self-reported NCD (independent variables), and the utilisation of dental health-care services (dependent variable). Because education and the wealth index, as proxy measures of the same variable – SES – were highly correlated, we decided to estimate two logistic regression models, including each as an independent variable in separate models. All independent variables described above, except wealth index in the first model and education in the

Table 1 Utilisation of dental services in the last year by adults in Republic of Srpska, Bosnia and Herzegovina, according to selected variables

Variable	Total sample (n) 4,128	Visited dentist (%) 20.1*	OR (95% CI)	P
Gender				
Male	1,906	18.6	1	
Female	2,222	21.3	1.24 (1.12–1.38)	<0.001
Age (years)				
18–24	371	38.8	4.96 (4.08–6.04)	<0.001
25–34	560	35.4	4.13 (3.46–4.94)	<0.001
35–44	645	22.8	2.43 (2.03–2.92)	<0.001
45–54	822	15.9	1.58 (1.31–1.90)	<0.001
55–64	748	15.0	1.62 (1.34–1.95)	<0.001
65+	982	9.8	1	
Type of settlement				
Urban	1,712	25.2	1.73 (1.57–1.92)	<0.001
Rural	2,415	16.4	1	
Marital status				
Living without partner	1,400	22.0	1.09 (0.98–1.22)	0.101
Married/living with a partner	2,716	19.0	1	
Education				
Low	1,685	11.1	0.20 (0.17–0.24)	<0.001
Middle	2,047	24.2	0.49 (0.42–0.57)	<0.001
High	391	36.8	1	
Employment status				
Inactive	1,916	15.1	0.72 (0.63–0.82)	<0.001
Employed	1,226	26.3	1.34 (1.17–1.53)	<0.001
Unemployed	982	21.7	1	
Wealth index group				
Low (worse-off)	1,652	14.6	0.51 (0.45–0.57)	<0.001
Middle (even)	823	19.3	0.73 (0.64–0.84)	<0.001
High (better-off)	1,653	25.8	1	
Self-perceived health				
Poor	391	12.0	0.45 (0.37–0.55)	<0.001
Average	1,416	13.9	0.51 (0.45–0.57)	<0.001
Good	2,321	25.2	1	
NCD				
Yes	1,714	14.4	0.62 (0.56–0.69)	<0.001
No	2,414	24.1	1	
Smoking status				
Current smoker	1,253	18.5	0.92 (0.82–1.03)	0.166
Former smoker	593	20.9	1.08 (0.93–1.24)	0.309
Non-smoker	2,266	20.7	1	
Physical activity				
Poor	538	13.8	0.70 (0.60–0.83)	<0.001
Average	1,660	20.0	0.88 (0.79–0.98)	0.026
Good	1,930	21.9	1	
Body mass index				
Obese (≥ 30)	852	20.3	1.07 (0.93–1.22)	0.313
Overweight (25.0–29.9)	1,506	20.1	1.00 (0.89–1.13)	0.892
Normal weight (≤ 24.9)	1,648	19.9	1	
Fruit consumption				
Yes	578	22.5	1.13 (0.99–1.30)	0.079
No	3,550	19.7	1	
Vegetable consumption				
Yes	354	22.6	1.07 (0.90–1.26)	0.468
No	3,774	19.8	1	

*Percentage of the total sample visiting a dentist; 1, reference category; NCD, non-communicable disease.

second model, were included in the analysis. The reported estimates and 95% CI were weighted using probability-sampling weights calculated to reflect the inhabitants of the RS in 2010. All statistical data analyses were conducted using SPSS statistical software, version 20.0 (SPSS Inc., Chicago, IL, USA). Values of $P < 0.05$ were considered statistically significant.

RESULTS

Only one-fifth (20.1%) of all respondents reported a visit to a dentist within the last year, with dentist visits being more frequent in female respondents (21.3%) than in male respondents (18.6%). Significant differences in frequency of dental visits were also observed according to age, type of settlement,

education, employment status, wealth index group, self-perceived health, NCD and physical activity (Table 1). The highest frequency of dental visits (38.8%) was found in the youngest (18–24 years) age group of participants and the lowest (9.8%) among the oldest participants (65+ years of age). A higher frequency of dental visits was reported by urban dwellers (25.2%), people with higher education (36.8% for high education and 22.4% for middle education), employed people (26.3%) in comparison with unemployed people (21.7%) and by those in the higher wealth index groups (25.8% for high wealth index and 19.3% for middle wealth index). Respondents who self-rated their health status as poor (12.0%) or average (13.9%), participants with NCD (14.4%) and those with poor (13.8%) and average (20.0%) physical activity less frequently utilised dental care services (Table 1). Smoking status, BMI and fruit and vegetable consumption were not associated with dental service utilisation (Table 1).

The main reasons for the utilisation and non-utilisation of dental services among participants within the last year are presented in Tables 2 and 3.

Dental treatment was the main reason for the utilisation of dental services in more than half (54.6%) of all participants and for almost one-quarter (24.9%) it was tooth extraction. Control/preventive check-up/consultation was the main reason for utilisation of dental services only in 9.7% of all participants (Table 2).

More than two-thirds (67.9%) of all participants reported that they had no need for dental service utilisation. Insufficient financial resources were cited as

the main reason by 13.6% of participants, while almost one participant in every 10 (9.4%) did not have enough time for dental care (Table 3).

To estimate the independent impact of demographic and socioeconomic characteristics on frequency of dental service utilisation, two models of multivariate logistic regression analyses were created (the first with all variables shown in Table 4 except the wealth index; and the second with all variables shown in Table 4 except education). According to the results from the first and second models, respectively, women (OR = 1.39 and OR = 1.30), younger people (OR = 0.97 in both models), urban dwellers (OR = 1.41 and OR = 1.61) and those who reported NCD (OR = 1.32 and OR = 1.33) used dental health-care services more frequently than their counterparts (Table 4). People with low and middle levels of education utilised dental care services less frequently than people with high levels of education (OR = 0.31; 95% CI: 0.25–0.38 and OR = 0.48; 95% CI: 0.40–0.57, respectively). Also, those who self-rated their health as average reported lower rates of dental visits than people with good self-perceived health (OR = 0.80 and OR = 0.76, respectively) (Table 4). When education was excluded from the multivariate logistic regression analysis (second model), the employed respondents were found to be 20% more likely to visit a dentist compared with unemployed respondents (OR = 1.20; 95% CI: 1.05–1.39). People from the low wealth index group had visited a dentist less frequently in the last year (OR = 0.79; 95% CI, 0.69–0.90) compared with people from the high wealth index group.

Table 2 Main reasons for utilisation of dental services among respondents

Reason	<i>n</i>	%
Dental treatment	452	54.6
Tooth extraction	206	24.9
Control/preventive check-up/consultation	80	9.7
Denture	68	8.2
Periodontitis	22	2.7
Total	828	100

Table 3 Main reasons for non-utilisation of dental services among respondents

Reason	<i>n</i>	%
No need	2,226	67.9
Insufficient financial resources	446	13.6
Not enough time	308	9.4
Long wait on services	84	2.6
Long distance to dentist	63	1.9
No trust in dentist	12	0.4
Other reasons	136	4.2
Total	3,275	100

DISCUSSION

Only 20% of all participants in the present study reported visiting a dentist in the year preceding the survey, which is low in comparison with the average of the EU-27 countries (57%)¹². While the majority of Europeans (50%) reported that the last time they visited a dentist it was for a check-up, examination or cleaning¹³, in the present study only 9.7% participants from RS reported visiting a dentist for such reasons. These low percentages of preventive visits could be explained by the decentralisation and deregulation of dental health services in RS, as in other Eastern European countries in the last decades. With privatisation, increasing numbers of people cannot afford private dental care. In some Eastern European countries, third-party payment systems have been introduced but unfortunately priority is not given to preventive dental care².

In contrast to developed countries^{3,6,14} where a preventive check-up was the main reason for visiting a dentist, the use of dental services in developing

Table 4 Results of multivariate logistic regression analyses on dental service utilisation

Variable	First model*		Second model†	
	OR (95% CI)‡	P	OR (95% CI)‡	P
Gender				
Female	1.39 (1.23–1.56)	<0.001	1.30 (1.16–1.47)	<0.001
Male	1		1	
Age				
Years	0.97 (0.96–0.97)	<0.001	0.97 (0.96–0.97)	<0.001
Type of settlement				
Urban	1.41 (1.25–1.58)	<0.001	1.61 (1.44–1.81)	<0.001
Rural	1		1	
Marital status				
Living without a partner	0.95 (0.85–1.08)	0.466	0.99 (0.88–1.11)	0.875
Married/living with a partner	1		1	
Employment status				
Inactive	1.12 (0.96–1.31)	0.138	1.07 (0.92–1.25)	0.356
Employed	1.08 (0.93–1.25)	0.308	1.20 (1.05–1.39)	0.010
Unemployed	1		1	
Education				
Low	0.31 (0.25–0.38)	<0.001	–	
Middle	0.48 (0.40–0.57)	<0.001	–	
High	1		–	
Wealth index group				
Low	–		0.79 (0.69–0.90)	<0.001
Middle	–		0.88 (0.76–1.01)	0.079
High	–		1	
Self-perceived health				
Poor	0.93 (0.71–1.21)	0.589	0.81 (0.62–1.06)	0.133
Average	0.80 (0.69–0.93)	0.004	0.76 (0.65–0.88)	<0.001
Good	1		1	
NCD				
Yes	1.32 (1.14–1.54)	<0.001	1.33 (1.14–1.55)	<0.001
No	1		1	

1, reference category; NCD, non-communicable disease.

*Wealth index excluded.

†Education excluded.

‡Adjusted for smoking, physical activity, body mass index, and fruit and vegetable consumption.

countries is often motivated by pain and need for emergency care^{15,16}. In the RS, routine treatment (54.6%) and emergency treatment (24.9%) were the main reasons for a visit to a dentist in the last year, compared with EU citizens (33% and 17%, respectively)¹³.

As in several other studies^{6,15,16} the main reason for non-utilisation of dental services in the RS was no need for dental care. The perception of not having a dental problem as a reason for not visiting the dentist, reported by more than two-thirds of persons in the RS with no dental visit (67.9%), highlights poor awareness about the importance of periodic dental visits for prevention, early detection of problems and effective treatment. The second reason for non-utilisation of dental services was insufficient financial resources, a reason also reported in other studies^{15,17}.

In the present study, factors found to be significantly associated with greater odds of reporting a dental visit included younger age, being female, residing in urban settlements, having higher education, being employed, belonging to the high wealth index group compared with the low wealth index group, having

good self-perceived health in comparison with average self-perceived health and having an NCD.

Our findings that female respondents were 63% more likely than male respondents to visit a dentist are in accordance with other studies^{4,6,14}. This study also indicates that younger people were more likely to utilise dental services; this has also been reported by several other^{4,18}, but not all, studies^{6,19}. In line with other studies^{5,6,20}, urban dwellers in this study were more likely to visit dentists than those who lived in rural areas.

The burden of oral disease and the need for dental care are highest amongst the poor and disadvantaged population groups in both developed and developing countries²¹. In our study, persons in the lowest tertile of wealth utilised dental services 21% less frequently compared with those in the highest tertile of wealth, which is in line with other studies using household wealth¹⁹ or household income^{4,6,7,14} as proxy measures for SES.

In our study, persons with a low and middle level of education were approximately 70% and 50% less likely to report a dental visit in the last year compared

with those with a high level of education (OR = 0.31 and OR = 0.48, respectively), a finding in line with other studies^{5,7,14,15,19,22}. This can be explained by the evidence that persons with a higher level of education may have a greater health awareness of the importance of regular dental visits.

Several studies^{4,19} have shown increased probability of dental care utilisation with lower self-rated oral health. However, the use of dental care services in Finland was associated with perceived good oral health²³, probably because of higher use of preventive oral health-care services in developed countries. We did not explore the impact of self-perceived oral health on the frequency of visits but we found that the likelihood of having visits to a dentist depends on self-perceived general health. Those with average self-perceived health reported lower rates of dental visits than people with good general health.

In our study, people with NCDs were found to be about 30% more likely to visit a dentist compared with those without NCDs (OR = 1.32 and OR = 1.33). This could be explained by the fact that NCDs, such as cardiovascular diseases, diabetes and cancer, share common lifestyle risk factors with oral diseases and can have implications for oral health²¹ and consequently for frequencies of dental visits.

The main strength of our study is that it comprised a large national representative sample of people aged 18 years and over from all regions of RS, which is generalisable to the whole adult population of RS. The survey was conducted in households, during leisure time, when all respondents had sufficient time to answer all questions. In addition, our study focussed on a broad range of demographic, socio-economic and health-related factors relevant for utilisation of dental services.

However, some limitations to the study deserve mention. The utilisation of health services was self-reported, which can underestimate or overestimate actual visits to a dentist. In addition, the cross-sectional design applied in our study does not allow inferences on causality, although, in the absence of data on routine statistics, cross-sectional surveys are the main sources for identifying inequalities in utilisation of dental health-care services.

CONCLUSION

Our study showed that the frequency of dental visits in the adult RS population is shockingly low. Only one-fifth reported a dental visit within last year. The main reasons for visiting a dentist were dental treatment and tooth extraction, and <10% of all participants reported prevention as the reason. The main barriers to dental utilisation were 'no perceived need' and 'insufficient financial resources'. Our study also

confirmed that sociodemographic factors are strong determinants of utilisation of dental health services in RS. Younger, women, urban dwellers, people with a higher level of education, those who were better-off, employed, who reported having NCDs and who self-perceived their health as good, utilised dental services more frequently than their counterparts. In order to minimise those differences, strengthening the oral health-care system aimed at increasing access to dental care could be an important step. In addition, oral health promotion policies and education programmes reinforcing the importance of regular dental visits need to be adopted in the RS as soon as possible.

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Conflict of interest

The authors declare that they have no competing interests.

REFERENCES

1. World Health Organization. Oral health. Fact sheet. World Health Organization, 2012. Available from: http://www.who.int/oral_health/publications/factsheet/en/. Accessed 11 August 2018.
2. Petersen PE. The world oral health report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO global oral health programme. *Community Dent Oral Epidemiol* 2003 31: 3–24.
3. Petersen PE, Kjoller M, Christensen LB *et al*. Changing dentate status of adults, use of health services, and achievement of national dental health goals in Denmark by the year 2000. *J Public Health Dent* 2004 64: 127–135.
4. Pavi E, Karampli E, Zavras D *et al*. Social determinants of dental health services utilisation of Greek adults. *Community Dent Health* 2010 27: 145–150.
5. Guiney H, Woods N, Whelton H *et al*. Predictors of utilisation of dental care services in a nationally representative sample of adults. *Community Dent Health* 2011 28: 269–273.
6. Christian B, Chattopadhyay A, Kingman A *et al*. Oral health care services utilisation in the adult US population: medical expenditure panel survey 2006. *Community Dent Health* 2013 30: 161–167.
7. Vásquez F, Paraje G, Estay M. Income-related inequality in health and health care utilization in Chile, 2000–2009. *Rev Panam Salud Publica* 2013 33: 98–106.
8. Public Health Institute of Republic of Srpska. Analysis of population health in Republic of Srpska in 2015. Banja Luka: Public Health Institute, 2016. Available from: <http://www.phi.rs.ba/>

- pdf/publikacije/Zdravstveno_stanje_stanovnistva_u_2015_web.pdf. Accessed 11 August 2018.
9. European Commission. Eurostat. Statistics Explained. Health-care personnel statistics dentist, pharmacists and physiotherapists. European Commission, 2017. Available from: http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_personnel_statistics_-_dentists,_pharmacists_and_physiotherapists. Accessed 11 August 2018.
 10. Janković S, Stojisavljević D, Janković J *et al.* Status of cardiovascular health in a transition European country: findings from a population-based cross-sectional study. *Int J Public Health* 2014 59: 769–778.
 11. Janković J, Simić S, Marinković J. Inequalities that hurt: demographic, socio-economic and health status inequalities in the utilization of health services in Serbia. *Eur J Public Health* 2010 20: 389–396.
 12. Janković J, Šiljak S, Erić M *et al.* Inequalities in the utilization of health care services in a transition European country: results from the national population health survey. *Int J Public Health* 2017 63: 261–272.
 13. European Commission. Oral health. Special Eurobarometer 330/Wave 72.3. TNS Opinion & Social. Brussels: EU, 2010. Available from: http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_330_en.pdf. Accessed 11 August 2018.
 14. Bhatti T, Rana Z, Grootendorfst P. Dental insurance, income and the use of dental care in Canada. *J Can Dent Assoc* 2007 73: 57.
 15. Aikins EA, Braimoh OB. Utilization of dental services among civil servants in Port Harcourt, Nigeria. *J Dent Res Rev* 2015 2: 62–66.
 16. Fotedar Sh, Sharma KR, Bhardway V *et al.* Barriers to the utilization of dental services in Shimla, India. *Eur J Gen Dent* 2013 2: 139–143.
 17. Maharani DA, Rahardjo A. Is the utilisation of dental care based on need or socioeconomic status? A study of dental care in Indonesia from 1999 to 2009. *Int Dent J* 2012 62: 90–94.
 18. Chattopadhyay A, Kumar JV, Green EL. The New York State minority health survey: determinants of oral health care utilization. *J Public Health Dent* 2003 63: 158–165.
 19. Bahramian H, Mohebbi SZ, Khami MR *et al.* Psychosocial determinants of dental service utilization among adults: results from a population-based survey (Urban HEART-2) in Tehran, Iran. *Eur J Dent* 2015 9: 542–550.
 20. Doescher M, Keppel G. Dentist supply, dental care utilization and oral health among rural and urban U.S. residents. Final Report 135, Seattle, WA: WWAMI Rural Health Research Center, University of Washington, 2015.
 21. Petersen PE, Bourgeois D, Ogawa H *et al.* The global burden of oral diseases and risks to oral health. *Bull World Health Organ* 2005 83: 661–669.
 22. Thomson WM, Williams SM, Broadbent JM *et al.* Long-term dental visiting patterns and adult oral health. *J Dent Res* 2010 89: 307–311.
 23. Raittio E, Kiiskinen U, Helminen S *et al.* Dental attendance among adult Finns after a major oral health care reform. *Community Dent Oral Epidemiol* 2014 42: 591–602.

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