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Snežana Knežević^{1,*}, Tamara Gajić^{2,3}, Dragan Vukolić⁴, Tatjana Marinković¹, Aleksandar Stevanović¹, Dragan Marinković⁵, Nela Đonović⁶, Dalibor Stajić⁶

**Impact of sick leave on general practitioner visits
among Serbia's working population**

Утицај боловања на посете лекару опште медицине
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¹Polytechnic Academy of Applied Studies, Belgrade, Serbia;

²Serbian Academy of Sciences and Arts, Jovan Cvijić Geographical Institute, Belgrade, Serbia;

³University of Business Academy in Novi Sad, EDUKA Faculty of Organizational Studies, Belgrade, Serbia;

⁴University of Business Studies, Faculty of Tourism and Hospitality, Banja Luka, Republic of Srpska, Bosnia and Herzegovina;

⁵University of Belgrade, Faculty of Special Education and Rehabilitation, Belgrade, Serbia;

⁶University of Kragujevac, Faculty of Medical Sciences, Department of Hygiene and Ecology, Kragujevac, Serbia

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***Correspondence to:**

Snežana KNEŽEVIĆ

Academy of Applied Studies Polytechnic, Katarine Ambrozić 3, 11000 Belgrade, Serbia

E-mail: lestas59@yahoo.com

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SUMMARY

Introduction/Objective Sick leave represents an indicator of health and has multiple consequences for individuals, employers, and the health system. In Serbia, association between sick leave and general practitioner visits has not been sufficiently explored. This study aimed to examine the association between sick leave and general practitioner visits among the working-age population in Serbia, considering predisposing, enabling, and need factors.

Methods Data from the 2019 Serbian National Health Survey were analyzed, based on a sample of 4,652 respondents aged 18–65 years. Descriptive statistics and logistic regression methods were used to identify factors associated with general practitioner visits in the previous 12 months, with sick leave (yes/no) included as a predictor in the model.

Results Multivariate analysis showed that sick leave was statistically significantly associated with a higher probability of general practitioner visits ($OR = 2.11$). The strongest enabling factor was having a chosen general practitioner ($OR = 3.95$), while significant predisposing factors included marital status, education, and type of employment. Among need factors, poor self-rated health, long-term limitations, and previous hospitalization were strongly associated with general practitioner visits. The model demonstrated good discriminatory ability ($Nagelkerke R^2 = 0.32$; $ROC AUC = 0.78$).

Conclusion Sick leave significantly increases the probability of general practitioner visits. Enabling and predisposing factors play a key role, particularly having a chosen general practitioner. The results indicate the importance of general practice accessibility as a resource for reducing inequalities in healthcare utilization among the working-age population in Serbia.

Keywords: behavior; general practice; healthcare disparities; occupational health; work

САЖЕТАК

Увод/Циљ Боловање представља показатељ здравља и има вишеструке последице по појединце, послодавце и здравствени систем. У Србији, повезаност између боловања и посете лекару опште медицине није довољно истражена. Циљ овог истраживања јесте да се испита повезаност боловања и посете лекару опште медицине међу радно активном популацијом у Србији, уз разматрање предиспонирајућих, омогућавајућих и фактора потреба.

Методе Анализирани су подаци из Националног истраживања здравља становника Србије 2019, на узорку од 4.652 испитаника старости 18–65 година. Коришћене су методе дескриптивне статистике и логистичка регресија ради идентификоваша фактора повезаних са посетама лекару опште медицине у претходних 12 месеци, при чему је боловање (да/не) укључено као предиктор у моделу.

Резултати Мултиваријантна анализа показала је да је боловање статистички значајно повезано са већом вероватноћом посете лекару опште медицине ($OR = 2,11$). Најјачи омогућавајући фактор био је поседовање изабраног лекара опште медицине ($OR = 3,95$), док су значајни предиспонирајући фактори укључивали брачни статус, образовање и тип запослења. Међу факторима потреба, здравље процењено као лоше, дуготрајна ограниченошт и претходна хоспитализација били су значајно повезани са посетама лекару опште медицине. Модел је показао добру дискриминативну способност ($Nagelkerke R^2 = 0,32$; $ROC AUC = 0,78$).

Закључак Боловање значајно повећава вероватноћу посете лекару опште медицине. Кључну улогу имају омогућавајући и предиспонирајући фактори, посебно поседовање изабраног лекара опште медицине. Резултати указују на значај доступности опште медицине као ресурса за смањење неједнакости у коришћењу здравствене заштите у радно активној популацији у Србији.

Кључне речи: понашање; општа медицина; неједнакост у здрављу; здравље на раду; посао

INTRODUCTION

Sick leave is a health indicator with significant implications for individuals, employers, and healthcare systems, affecting productivity and healthcare costs [1, 2, 3]. Although studies have examined the determinants of sick leave [1–5], the relationship between sick leave and primary care utilization, particularly general practice, is less understood.

General practitioners (GPs) play crucial roles in health promotion, prevention, diagnosis, and treatment, making them pivotal in providing continuity of care [6, 7, 8] and acting as gatekeepers to specialized services [8–10]. They address socio-economic issues, and their attitudes, practices, and recommendations for workplace adjustments can impact absenteeism [6]. Despite their multifaceted roles, the impact of GPs concerning sick leave certification remains inadequately researched [3, 6, 8].

In Serbia, GPs serve a central role in primary healthcare, with around 70 % of population using public services [11]. Since 2005, patients have been able to choose GPs, and capitation has been introduced to incentivize quality [11, 12]. General practice is delivered through 158 primary health centers [12]. By 2019, Serbia had 3,493 GPs, with a preference for public over private services (69.4% vs. 5.6%) [11]. GPs are responsible for certifying sick leave that validates the need for time off from work due to health issues, and influences the management of health conditions [3, 6, 8, 11]. The certification impacts an individual's access to sick leave and the workflow within general practice settings, making it a key aspect in understanding the relationship between sick leave and utilization of this sector.

This study aims to examine the impact of sick leave on the frequency of GP visits, providing insights into general practice utilization patterns among Serbia's working population.

METHODS

This secondary data study utilized information from the 2019 Serbian National Health Survey. The survey was conducted by the Republic Bureau of Statistics, the Dr. Milan Jovanovic Batut Institute of Public Health of Serbia, and the Ministry of Health of the Republic of Serbia [13]. The survey followed the methodology of the European Health Interview Survey (EHIS - Wave 3), an international study aimed at assessing population health across the European Union. Methodology ensures representative data for calculating health indicators, enabling cross-national comparisons.

A stratified two-stage sampling method was used to assess health factors nationally. Out of 13,589 registered household members aged 15 and over, 11,790 completed the self-completion questionnaire (response rate 89.5%). Secondary data from 4,652 working-age individuals, aged 18 to 65, were analyzed [13]. Three types of questionnaires were employed: a household panel, face-to-face interviews, and a self-reporting questionnaire.

This study followed Andersen's behavioral model [14], categorizing factors into predisposing, enabling, and need factors. Predisposing factors included demographic and socioeconomic

characteristics: gender (male/female), age (18-25 to 56-65), marital status (married, single, divorced, widowed), education (college/university, middle, primary school), employment status (self-employed, employed by an employer), and occupations classified as blue-collar (manual labor, skilled trades, service industry jobs) or white-collar (office jobs, professional roles, technical positions) [14, 15]. Enabling factors included having a chosen general practitioner (yes/no), wealth index (rich, middle, poor), and geographic region (Belgrade, Northern, Central and Western, and Southern and Eastern Serbia) [14, 15]. Need factors focused on sick leave, self-rated health, long-standing activity limitations, and hospitalization [14, 15]. Variables were coded as categorical or dichotomous. Sick leave was categorized based on whether respondents had taken sick leave in the past twelve months (yes/no). The dependent variable was whether the respondent had visited a GP in the past twelve months (yes/no).

The data were analyzed using Chi-square tests (χ^2) to examine associations between categorical variables, with significance set at $p < 0.05$. Logistic regression (univariate and multivariate) assessed the relationship between independent variables and GP visits, with sick leave included as an independent variable. Results were reported as odds ratios (ORs) with 95% confidence intervals (CIs). Multicollinearity was checked using variance inflation factors, all below 5. Model fit was confirmed by the Hosmer-Lemeshow test ($p > 0.05$), Nagelkerke R^2 , and ROC analysis. Cross-validation confirmed the model's stability across different data subsets. Outliers and influential data points were assessed using Cook's distance, with necessary adjustments made to ensure model accuracy and validity. All analyses were performed using IBM SPSS Statistics, Version 20.0 (IBM Corp., Armonk, NY).

Ethics: The 2019 Serbian National Health Survey adhered to international ethical standards (Declaration of Helsinki, 2008), the Decision on the Program of Official Statistics, and the Regulation on establishing the Plan of Official Statistics 2019 [13]. Privacy and data confidentiality were protected under the General Data Protection Regulation [13]. Participants received written information about the study's purpose, rights, and details for inquiries or complaints, providing written informed consent. Anonymity was ensured through data de-identification, stored securely, and results published in an aggregated form. Permission for secondary data use was obtained from the Dr. Milan Jovanović Batut Institute of Public Health of Serbia.

RESULTS

The study comprised 4,652 working individuals (mean age 42.68 ± 11.2 years). Overall, 15.8% reported sick leave in the past twelve months, with a higher prevalence among women (18.2%)

than men (13.9%). Analysis of socio-demographic, economic, and health characteristics of respondents revealed statistically significant differences between individuals who used sick leave and those who did not. Sex was significantly associated with sick leave, with a higher proportion of women in the sick leave group compared to the group without sick leave (55.5% vs. 45.5%; $p < 0.001$). Age structure differed significantly between groups ($p < 0.001$). The sick leave group had a lower proportion of younger respondents (18–25 years), while those aged 46–55 and 56–65 years were more represented compared to the group without sick leave. Marital status also showed a significant association with sick leave ($p < 0.001$). The proportion of widowed and divorced individuals was considerably higher among those who used sick leave, while the proportion of single individuals was lower compared to the group without sick leave. Significant differences were recorded according to education level ($p = 0.044$). The sick leave group had a lower proportion of respondents with higher education, while the respondents with primary education were more pronounced compared to the group without sick leave. Employment status was statistically significant ($p < 0.001$), with employees working for an employer using sick leave more frequently compared to the self-employed. Among enabling factors, having a chosen GP was strongly associated with sick leave ($p < 0.001$), with almost the entire sick leave group having a chosen GP. Differences were also found according to wealth index ($p = 0.049$), as well as region of residence ($p < 0.001$). Health indicators exhibited the most pronounced differences between groups. Self-rated health differed significantly ($p < 0.001$), with the sick leave group having a considerably higher proportion of respondents with poorer health status. The presence of long-term health limitations was significantly more frequent in sick leave ($p < 0.001$). Additionally, hospitalization in the previous 12 months was significantly more prevalent in the sick leave group ($p < 0.001$) (Table 1).

In the sample of 4,652 respondents, 3,434 respondents (73.8%) had at least one visit to a GP in the previous 12 months (Table 2).

The results of univariate logistic regression analysis showed that predisposing, enabling, and need factors were significantly associated with GP visits. Among predisposing factors, sex was a significant predictor, with women having a higher probability of GP visits compared to men ($OR = 1.35$; $p < 0.001$). Older age groups had an increased probability of visits compared to the reference group (18–25), with the most pronounced effect observed among respondents aged 56–65 years ($OR = 1.95$; $p < 0.001$).

Single individuals had a significantly lower probability of visits compared to married individuals ($OR = 0.54$; $p < 0.001$), while divorced had an increased probability of GP visits compared

to married individuals ($OR = 1.91$; $p = 0.024$). Respondents with secondary education visited GPs less frequently compared to respondents with higher education ($OR = 0.84$; $p = 0.013$). Employed by an employer had a higher probability of GP visits compared to self-employed individuals ($OR = 1.41$; $p < 0.001$).

Among enabling factors, having a chosen GP showed the strongest association with GP visits, with more than four times higher probability of visits compared to respondents without a chosen GP ($p < 0.001$). Respondents from the middle economic class visited GPs less frequently compared to the higher class ($OR = 0.82$; $p = 0.014$). Compared to Belgrade residents, respondents from other regions had a higher probability of GP visits, with the most pronounced effect recorded in Southern and Eastern Serbia ($OR = 2.32$; $p < 0.001$).

Need factors showed associations with GP visits. Respondents who used sick leave had three times higher odds of visiting a GP compared to those without sick leave ($p < 0.001$). Respondents who rated their health as fair/poor had a higher probability of GP visits compared to respondents with good health ($OR = 3.43$; $p < 0.001$). The presence of long-term health limitations was strongly associated with GP visits ($OR = 2.75$; $p < 0.001$), while previous hospitalization represented the strongest single predictor ($OR = 6.70$; $p < 0.001$) (Table 3).

The multivariate logistic regression model showed satisfactory discriminatory ability (Nagelkerke $R^2 = 0.32$; ROC AUC = 0.78), indicating good model capability to distinguish between respondents with and without GP visits.

Among predisposing factors, marital status and education retained statistical significance in the multivariate model. Single individuals had a lower probability of GP visits compared to married ($OR = 0.62$; $p < 0.001$), while respondents with secondary education visited GPs less frequently compared to respondents with higher education ($OR = 0.82$; $p = 0.026$). Employment status also showed a significant association, with respondents employed by an employer having a higher probability of GP visits compared to self-employed ($OR = 1.29$; $p = 0.014$).

Among enabling factors, having a chosen GP showed the most pronounced association with GP visits, with respondents with a chosen GP having almost four times higher probability of visits compared to those without a chosen GP ($p < 0.001$).

Need factors remained statistically significant in the multivariate model. Sick leave remained a significant independent predictor of GP visits ($OR = 2.11$; $p < 0.001$). Respondents who rated their health status as fair had an increased probability of GP visits compared to respondents with good or very good self-rated health ($OR = 1.49$; $p = 0.002$). The presence of long-term health limitations was associated with twice the probability of GP visits ($p < 0.001$), while

previous hospitalization represented a strong predictor of GP visits (OR = 3.99; $p = 0.002$) (Table 4).

DISCUSSION

This study examined the association between sick leave use and frequency of GP visits in the working-age population of Serbia, using data from the 2019 Health Interview Survey. The results provide insight into patterns of primary healthcare utilization in the context of sick leave, with particular emphasis on the role of chosen GPs among the working-age population.

In our sample, 15.8% of respondents reported sick leave use [16]. Multivariate logistic regression analysis revealed that after adjusting for predisposing, enabling, and need factors, eight variables remained independently associated with GP visits: sick leave, marital status, education, employment status, having a chosen GP, self-rated health, long-term limitations, and hospitalization. Notably, sex, age, wealth index, and region—which showed significant associations in univariate analysis—did not retain significance in the adjusted model.

Sick leave emerged as a statistically significant independent predictor of GP visits. Respondents who used sick leave had more than twice the probability of GP visits compared to those without sick leave. The attenuation of the effect in the adjusted model suggests that the association between sick leave and GP visits is partially mediated by health-related factors. This finding confirms the dual role of GPs in certifying sick leave and managing health conditions [3, 6, 8].

Sex showed a significant association in univariate analysis, with women having higher odds of GP visits compared to men. However, unlike some international studies [7, 15, 16], sex did not remain significant in the multivariate model. This suggests that the observed differences between men and women can be explained by other factors included in the model, such as marital status, education, employment type, and health status.

Similarly, age demonstrated a clear gradient in univariate analysis, with older age groups showing progressively higher odds of GP visits. However, age did not remain significant in the multivariate model after adjusting for other factors. This suggests that the age-related increase in GP visits is largely explained by the higher prevalence of health needs and greater likelihood of having a chosen GP among older individuals.

Marital status retained statistical significance in the multivariate model. Single individuals had a significantly lower probability of GP visits compared to married. This finding aligns with previous research suggesting that married individuals may have better health-seeking behavior and social support that facilitate healthcare utilization [3, 16, 17].

Education emerged as an independent predictor, with respondents with secondary education visiting GPs less frequently compared to those with higher education. Lower visit rates among individuals with lower education indicate the importance of educational status as a determinant of health literacy, which has been confirmed in previous studies [3, 16, 17].

Employment status also showed a significant association in the multivariate model, with respondents employed by an employer having a higher probability of GP visits compared to self-employed individuals. This finding indicates potentially better institutional support and easier access to healthcare services in the formal employment sector [4].

Having a chosen GP emerged as the strongest predictor of GP visits in the multivariate model, with respondents who had a chosen GP showing almost four times higher probability of visits compared to those without one. This emphasizes the crucial role of continuity of primary healthcare in Serbia. In Serbia, as in many European countries, the GP plays a central role in assessing work capacity and certifying sick leave, which encourages contacts with the healthcare system [7, 18, 19]. This association underscores the importance of ensuring universal access to chosen GPs as a fundamental component of equitable healthcare.

The wealth index showed a significant association in univariate analysis but did not remain significant in the multivariate model. This finding, unlike the previous study [20], suggests that in Serbia's context, economic disparities in GP utilization may be mediated by other factors, indicating universal access to primary healthcare regardless of socioeconomic status.

Region of residence demonstrated significant associations in univariate analysis, with all regions outside Belgrade showing higher odds of GP visits. However, regional differences did not retain significance in the multivariate model. This suggests that the observed geographic variation in GP utilization may be explained by differences in the distribution of chosen GPs, socio-demographic characteristics, and health needs across regions [18].

Need factors remained statistically significant predictors in the multivariate model, demonstrating their fundamental role in driving GP utilization. Respondents who rated their health as fair had an increased probability of GP visits compared to those with good or very good self-rated health. The presence of long-term health limitations was associated with more than twice the probability of GP visits, while previous hospitalization represented one of the strongest predictors. These findings are consistent with studies conducted in Sweden [2], confirming that health needs are the primary driver of primary care utilization.

Although the study has the advantage of a representative sample, certain limitations should be considered. The data are based on self-reporting, which may lead to information bias, and the

cross-sectional study design precludes drawing causal conclusions. Additionally, the specific mechanisms through which sick leave and the role of the chosen GP affect visit frequency were not examined in detail. Future longitudinal research could deepen understanding of these relationships.

The study identifies key factors influencing GP visits in Serbia, with sick leave playing a significant role in increasing primary healthcare utilization. The findings indicate the need to strengthen cooperation between primary healthcare and occupational medicine services to improve healthcare for the working-age population. Higher visit rates among employees on sick leave confirm the role of GPs in certifying sick leave and managing health conditions.

The observed differences in visits according to education and employment status in the multivariate model indicate the existence of inequalities in healthcare access. Particularly lower visit rates among individuals with lower education and the self-employed indicate the need to improve health literacy and reduce structural barriers to healthcare services access. The strong independent effect of having a chosen GP emphasizes the critical importance of ensuring universal registration as a mechanism for reducing healthcare inequalities. The strong association of long-term limitations and previous hospitalizations with GP visits confirms the importance of an accessible primary healthcare system that ensures continuity of care for the working-age population of Serbia.

CONCLUSION

This study identifies the key factors influencing general practitioner visits among Serbia's working-age population, with sick leave playing a crucial role in increasing healthcare utilization. Predisposing factors such as marital status, education, and employment status, along with having a chosen GP, significantly affect the likelihood of GP visits. Need factors, including self-rated health, long-term activity limitations, and previous hospitalization, further influence healthcare-seeking behavior. General practitioners are pivotal in managing health during periods of sick leave certification. To reduce inequalities and improve access to general practice, targeted policies are essential. Ensuring universal registration with chosen GPs, improving health literacy among lower-educated individuals, and strengthening support for self-employed workers can address disparities and enhance health outcomes across Serbia's working-age population.

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Table 1. Distribution of participants characteristics

Variable	Category	N	%	Without sick leave N (%)	With sick leave N (%)	$\chi^2/df/p$
Gender	Male	2469	53.1	2179 (54.5)	290 (44.5)	20.99/1/ < 0.001
	Female	2183	46.9	1821 (45.5)	362 (55.5)	
Age (years)	18–25	322	6.9	301 (7.5)	21 (3.2)	33.98/4/ < 0.001
	26–35	963	20.7	859 (21.5)	104 (16)	
	36–45	1298	27.9	1127 (28.2)	171 (26.2)	
	46–55	1250	26.9	1066 (26.7)	184 (28.2)	
	56–65	819	17.6	647 (16.2)	172 (26.4)	
Marital status	Married	3420	73.5	2979 (74.5)	441 (67.6)	70.80/3/ < 0.001
	Single	836	18	749 (18.7)	87 (13.3)	
	Widowed	324	7	228 (5.7)	96 (14.7)	
	Divorced	72	1.5	44 (1.1)	28 (4.3)	
Education	College/University	1380	29.7	1,212 (30.3)	168 (25.8)	6.24/2/0.044
	Middle school	2880	61.9	2515 (62.9)	365 (56)	
	Primary school	392	8.4	273 (6.8)	119 (18.3)	
Employment status	Self-employed	560	12	515 (12.9)	45 (6.9)	14.61/1/ < 0.001
	By an employer	4092	88	3485 (87.1)	607 (93.1)	
Occupation	Blue collars	2690	57.8	2348 (58.7)	342 (52.5)	0.32/1/0.572
	White collars	1962	42.2	1652 (41.3)	310 (47.5)	
Chosen GP	No	176	3.8	162 (4.1)	14 (2.1)	127.51/1/ < 0.001
	Yes	4476	96.2	3838 (95.9)	638 (97.9)	
Wealth index	Rich class	2540	54.6	2209 (55.2)	331 (50.8)	6.02/2/0.049
	Middle class	980	21.1	845 (21.1)	135 (20.7)	
	Poor class	1132	24.3	946 (23.7)	186 (28.5)	
Region	Belgrade	1157	24.9	988 (24.7)	169 (25.9)	73.15/3/ < 0.001
	Northern Serbia	1111	23.9	962 (24.1)	149 (22.9)	
	Central/Western Serbia	1401	30.1	1215 (30.4)	186 (28.5)	
	Southern/Eastern Serbia	983	21.1	835 (20.9)	148 (22.7)	
Self-rated health	Very good / good	3450	74.2	3086 (77.2)	364 (55.8)	82.99/2/ < 0.001
	Fair	900	19.4	742 (18.6)	158 (24.2)	
	Bad / very bad	302	6.5	172 (4.2)	130 (19.9)	
Long-standing limitations	No	2950	63.4	2681 (67)	269 (41.3)	169.42/1/ < 0.001
	Yes	1702	36.6	1319 (33)	383 (58.7)	
Hospitalisation	No	4000	86	3535 (88.4)	465 (71.3)	28.31/1/ < 0.001
	Yes	652	14	465 (11.6)	187 (28.7)	

Table 2. General practitioner visits in the previous 12 months

General practitioner visit	N	%
No	1218	26.2
Yes	3434	73.8
Total	4652	100

Table 3. Univariate analysis of factors associated with GP visits

Variable	OR (95% CI)	p
Predisposing factors		
Sex (female vs. male)	1.35 (1.19–1.53)	< 0.001
Age 36–45 (vs. 18–25)	1.37 (1.06–1.77)	0.017
Age 46–55 (vs. 18–25)	1.56 (1.20–2.03)	0.001
Age 56–65 (vs. 18–25)	1.95 (1.47–2.59)	< 0.001
Single (vs. married)	0.54 (0.47–0.63)	< 0.001
Divorced (vs. married)	1.91 (1.09–3.35)	0.024
Secondary education (vs. higher)	0.84 (0.73–0.96)	0.013
Employed by an employer (vs. self-employed)	1.41 (1.18–1.68)	< 0.001
Enabling factors		
Chosen GP (yes vs. no)	4.05 (3.13–5.24)	< 0.001
Middle class (vs. higher)	0.82 (0.69–0.96)	0.014
Northern Serbia (vs. Belgrade)	1.39 (1.17–1.67)	< 0.001
Central/Western Serbia (vs. Belgrade)	1.25 (1.05–1.47)	0.010
Southern/Eastern Serbia (vs. Belgrade)	2.32 (1.90–2.83)	< 0.001
Need factors		
Sick leave (yes)	2.98 (2.69–3.64)	< 0.001
Fair self-rated health (vs. good)	2.46 (1.98–3.06)	< 0.001
Poor self-rated health (vs. good)	3.43 (1.85–6.36)	< 0.001
Long-term health limitations (yes)	2.75 (2.36–3.21)	< 0.001
Hospitalization in the previous 12 months (yes)	6.7 (3.04–14.75)	< 0.001

*Reference categories: male, age 18–25 years, married, higher education, self-employed, no chosen GP, higher class, Belgrade region, no sick leave, good self-rated health, no long-term health limitations, and no hospitalization

Table 4. Multivariate logistic regression – predictors of GP visits in the previous 12 months

Variable	OR	95% CI	p
Predisposing factors			
Single (vs. married)	0.62	0.51–0.76	< 0.001
Secondary education (vs. higher)	0.82	0.69–0.98	0.026
Employed by an employer (vs. self-employed)	1.29	1.05–1.58	0.014
Enabling factors			
Chosen general practitioner (yes)	3.95	2.97–5.24	< 0.001
Need factors			
Sick leave (yes)	2.11	1.69–2.64	< 0.001
Fair self-rated health (vs. good / very good)	1.49	1.15–1.93	0.002
Long-term health limitations (yes)	2.06	1.71–2.49	< 0.001
Hospitalization in the previous 12 months (yes)	3.99	1.64–9.72	0.002

*Reference categories: married, higher education, self-employed, no chosen GP, no sick leave, good/very good self-rated health, no long-term health limitations, and no hospitalization