PHYSICAL ACTIVITY AND HEALTH CARE UTILIZATION IN ROMANIA

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Abstract: *For all EU countries, regardless of the type of health care system, managing the increase of health services costs is a medium- and long-term strategic objective. To support this approach, it is a priority to analyze the health needs of population, the types and frequency of the demand for health services, the factors that determine the structure and dynamics of health care utilization, the profile of people using the health system, etc. Equally, it is important to study the ways and possibilities of reducing health expenditures by using various tools that can be made available to citizens. Such an instrument is the regular practice of physical activity by all categories of population. Based on this background, the aim of our study is to analyze the relationship between physical activity and health care utilization for a Romanian representative sample. The data was retrieved from the second wave of the European Health Interview Survey (EHIS) 2014. The relationship between physical activity and the use of each type of health care services was evaluated by means of incidence rate ratios (IRR) obtained through negative binomial regression models. Our main findings show that physical activity level is negatively associated with the amount of health care utilization, suggesting that, on average, high and moderately active people use significantly fewer health care services compared with low active people.*
Keywords: *Physical activity, health care utilization, EHIS 2014*.

1. INTRODUCTION

Literature on health care determinants underlines the importance and benefits of physical activity on population health status. World Health Organization (WHO) shows that physical activity reduces the risk of hypertension, diabetes, breast and colon cancer, coronary heart disease, stroke, depression and the risk of falls (WHO, 2010). Physical activity has been proposed and globally recognized as a complementary or even as an alternative treatment which may help to recover from or prevent different diseases. Thereby, physical activity emerged as an essential dimension of lifestyle or healthy lifestyle for European and worldwide countries. Equally, several scholars have studied the impact of physical inactivity on health considering different categories of people, especially young and elderly people. According to WHO, the lack of physical activity is the fourth leading factor for global mortality, with major implications for the general health of the population throughout the world. Physical inactivity is the main cause for approximately 27% of diabetes, 25% of breast and colon cancers, and 30% of ischemic heart disease (WHO, 2010).

In any public health system, physical activity becomes a distinct research area either for public health practices or public health policies. In addition, this topic is very important for professionals, universities, or governmental organizations. The impact of physical activity on health care system is also analyzed, especially regarding the decreased demand for health care services, and thus the decrease in health care related costs (Katzmarzyk *et al.*, 2000; Katzmarzyk & Janssen, 2004; Anderson *et al.*, 2005; Andreyeva & Sturm, 2006; Jacobs *et al.*, 2013; Kang & Xiang, 2017). The relationship between physical activity and the use of health care services have been studied within different social and economic contexts, for various categories of individuals, and different health systems. In general, these studies indicate the existence of a negative association between physical activity and health care utilization. For instance, more physically active individuals uses less medicines and fewer inpatient and outpatient services (Fisher *et al.* 2015; Wang *et al.* 2005; Sari, 2009, 2010; Denkinger *et al.*, 2012; Katzmarzyk & Lear 2012; Rocca *et al.*, 2015; Nichèle & Yen, 2016; Omorou *et al.*, 2017; Fernandez-Navarro, 2017). Nevertheless, many studies highlight that the use of preventive services is positively associated with physical activity, suggesting that more physically active people tend to be more cautious regarding their health (Kang & Xiang, 2017). In this vein, most studies indicate that an increase in the level of physical activity may indirectly lead to a decrease in the public cost of health.

The analysis of the relationship between physical activity and health care utilization at the level of Romania implies taking into account a number of particularities of this EU member country that has a very interesting profile. According to statistical data provided by UNICEF (TransMonEE database 2018), Romania ranked 7th in population size, but steadily declining since 1990, which lead to the lowest fertility rates (an average of 1.4 children per woman after 1990) and the highest abortions rates (an average of 122 abortions per 100 live births after 1990). Furthermore, Romania has a low level of economic development (an average of GDP per capita, PPP based, of $ 10 thousand after 1990) and a high level of income inequality and an increasing at-risk-of-poverty rate after 2005 (with an average of 21.4%). Life expectancy has increased significantly over the past 30 years, but the gap between men and women remains one of the highest (an average of 68 years for men and 75 years for women). Mortality is steadily increasing (from 10 to 13 deaths per thousand inhabitants), demographic and social disparities between rural and urban remain significant, and infant mortality is the highest in the EU (7.5 deaths under 1 year at 1000 live births in 2016 compared to 26 deaths in 1990). Regarding the health system, Romania's position is always among the last rank positions, by the side of countries with the lowest percentages of GDP spent on health (with an average of less than 4% of GDP after 1990). The health system is financed in proportion of over 80% from the state budget, and after 1990 the law for regulating this system has been constantly modified by the various political parties in power. In the reform attempts it was always mentioned the underfunding of the system, the inefficient use of the allocated money, the complicated mechanisms of health expenditure settlement, the corruption, the development of the private health services by the doctors working in the public system, etc. In addition, the lack of funds has always led to approaches that stressed the need to lower health care costs.

As emphasized by various studies (Ministry of Health, 2018; Vlădescu *et al.*, 2016), among the health risk factors of Romanian population, besides alcohol and tobacco consumption and an unhealthy diet, the level of individuals' engagement in physical activities is low. In this respect, the research on the linkage between physical activity and health status, as well as those regarding the impact of physical activity on the use of health care services is relatively limited. Most of the papers published on these topics focus just on certain segments of the population or on particular clinical trials, but the strand of literature using a representative sample from the general population is underdeveloped. Therefore, physical activity is analyzed in relation to body mass index (BMI), a range of health-related behaviours (Zadarko *et al.*, 2014; Roman *et al.*, 2016; Lotrean *et al.*, 2018), health-related quality of life (Badicu, 2018), social health (Badicu & Balint, 2016), or sedentary behaviours (Biddle et al. 2009). Few studies focus on the use of health care services, but not in direct relation with physical activity (Leopold *et al.*, 2010; Ungureanu *et al.*, 2013; Damian, 2014; Vogler *et al.*, 2015).

Within the Romanian context, the analysis of physical activity impact on health care services is extremely important especially because of the crisis and transition situation the public health system is going through (Karanikolos and Mckee 2011; Vlădescu *et al.*, 2016). In this regard, the existing literature underlines the need to reform this system, as well as to find ways to reduce costs in a period of scarcity and health underfunding. As the research on other EU countries shows, it could be analyzed to what extent an increase of physical activity could lead to the decrease in the use of health care services and which are the socio-economic and demographic characteristics that contribute to this significant relationship.

The aim of our study is to analyze the relationship between physical activity and health care utilization for a Romanian representative sample. The data used are provided by the European Health Interview Survey (EHIS) 2014, which allow an overall analysis of the context of healthcare utilization in relation to physical activity at national level. To our knowledge, no such studies have been conducted using the same data for Romania case. After a detailed presentation of the data set in the next section, empirical issues are briefly discussed in Section 3. Section 4 illustrates the main empirical results. The study ends with a series of concluding remarks, discussions, and references.

2. DATA AND METHODOLOGY

2.1. Data used

In this paper we use the dataset provided by Eurostat from the 2014 European Health Interview Survey (EHIS) for Romania. The EHIS is a health information system developed by Eurostat aiming to measure the health status, lifestyle and health care services used by European populations. Access to the confidential microdata files was carried out through the Centre for Research on Economic and Financial Integration

(CRIEF) at the University of Poitiers following an evaluation of the research proposal application by Eurostat.

The EHIS consists of three health modules, namely health status, health determinants, health care utilization, and one module focusing on broader socio-economic and demographic characteristics of the population aged 15 or over living in non-institutional households residing in the territory of the country. Our final sample consists of 16605 observations.

2.2. Measures

The variables used in the present analysis have been shown to be of importance in public health studies and are in accordance with the aim of our study.

2.2.1 Dependent variables

The health care utilization module from the EHIS survey provides the dependent variables of this study. From the indicators measuring the healthcare services utilization, we select five numerical variables that count the number of services used by population during the previous 12 months or the past four weeks. According to EHIS structure of healthcare services, a brief description of the dependent variables used in this study is presented in Table 1.

Table 1 Dependent variables

Variables	descpription	VALUES
Nb_Nights_hospit	Number of nights spent as a patient in a hospital in the past 12 months.	0 – (>10)
Nb_Days_hospit	Number of times admitted as a day patient in a hospital in previous 12 months.	0 – 3
Nb_Generalist	Number of consultations of a general practitioner or family doctor during the past four weeks (for personal treatment).	0 – (>11)
Nb_Specialist	Number of consultations of a medical or surgical specialist during the past four weeks (for personal treatment).	0 – (>3)
Nb_Prev_services	Number of preventive services (including blood pressure, blood cholesterol, and blood sugar measurement, and occult blood test) used during the last 12 months.	0 – 4

Source: Authors' elaboration based on the guidelines provided by Eurostat

2.2.2 Main independent variable

Physical activity is the main independent factor of interest in our analysis. The basis for measuring the indicator levels consists in the respondents' answer to a set of questions about the frequency and the amount of time spent doing physical activity in transport and free time during a regular week. Regarding the transport domain, walking and riding a bike are considered physical activities, while the self-related leisure physical activities include sports. Using the data provided by EHIS survey, for all types of physical activity the reported number of days per week and the duration per day (expressed in minute intervals) are determined.

For the assessment of physical activity levels we use the IPAQ methodology (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ), 2005). This methodology assigns a MET score (Metabolic Equivalent of Task) for each type of physical activity. As a measure, one MET is defined as the energy it takes to sit quietly. According to IPAQ, walking is a moderate activity evaluated at 3.3 METs, cycling is a high intensity activity with 6 METs, and for sports are attributed 8 METs.

Based on the EHIS data, we compute the MET minutes spent on physical activity per week for each individual from the sample, both for transportation (walking and bicycling) and leisure-time (sports) domains. The MET-minutes/week is calculated by multiplying the METs score with the number of days per week and the number of minutes per day. For the former component, it is important to mention that we took into consideration the midpoints for each minute interval as we did not dispose of the exact amount of time for the three types of physical activity. As a measure for PA we use a nominal variable based on the classification of physical activities according to their intensity estimated in MET-minutes/week. In this vein, following the IPAQ guidelines, three level of physical activity are defined: low active (less than 600 MET-minutes per week); moderately active (between 600 and 3000 MET-minutes per week); high active (more than 3000 MET-minutes per week).

2.2.3 Control variables

The control variables are divided into two major topics such as individual characteristics and variables describing different health behaviors. The individual characteristics correspond to demographic and socio-economic determinants, which in the present study are:

- *sex* of respondent, categorized as males and females;
- *age* of respondent in completed years at the time of the interview, which was stratified in three age intervals: adolescent (15-19 years), adult (20-64 years), elderly (65 years and older);
- *education level* is measured on the basis of ISCED 2011 classification and represents the highest level of education completed by respondents. Following the structure of the European Education System 2018/2019, we regrouped the levels of education in three categories: primary education level, secondary education level, and tertiary education level;
- *legal marital status*, sorted into four groups: divorced, married, unmarried, widower;
- *employment status*, expressed as a nominal variable with three categories: employed, self-employed, unemployed;
- *income* is presented as a nominal variable based on five quantiles: < Q1; Q1-Q2; Q2-Q3; Q3-Q4; Q4-Q5;
- *degree of urbanization* groups the population in three areas: densely-populated area, intermediate-populated area, thinly-populated area.

The second list of control variables consists of different individual and environmental determinants describing four different health behaviours such as height and weight, smoking, alcohol, and fruits and vegetables consumption:

- *Body Mass Index* (BMI) is calculated as the weight in kilograms divided by the square of the height in meters. Based on the values obtained and according to WHO guidelines, three categories of BMI status are defined: normal weight (< 25 kg/m^2); overweight (25-29.9 kg/m^2), and obese (≥ 30 kg/m^2);
- *smoking* consumption is measured by means of the *type of smoking behaviour*, including three groups: daily smoker, occasional smoker, and no-smoker;
- *alcohol* consumption is expressed by frequency of consumption of an alcoholic drink in the past 12 months, which enabled us to divide the respondents into three categories of risk: no-risk, low risk, increased risk;
- *nutrition* concerns the fruits and vegetables consumption and is defined by two separate variables indicating the *frequency of eating fruits and vegetables* on a daily basis or per week (1 or more times a day, 4-6 times per week, 1-3 times per week, less than 1 time per week, never). An aggregated variable indicating the respondents' behaviour related to the consumption of fruits and vegetables is stratified into three groups: insufficient, moderate, and sufficient.

3. STATISTICAL ANALYSIS

3.1. Count data models

The modelling of the association between the individual physical activity levels and the amount of health care utilization, controlled by the covariates mentioned above, is employed by means of count data models techniques. Although the basic count data model is a Poisson regression model, it explicitly imposes the equidispersion assumption, meaning that the conditional mean of the dependent variable is equal to the conditional variance. In practice, this strong assumption is often violated, frequently due to a high level of dispersion of the dependent variable, which is known as overdispersion. This problem, inherent to the Poisson model, implies the underestimation of standard deviations of the estimated parameters, which in the end produces inefficient estimates (Cameron & Trivedi, 1998). It is noteworthy that overdispersion has two main causes, namely unobserved individual heterogeneity and/or a high proportion of zeros observed for dependent variables.

In the literature studying the relationship between physical activity and health care utilization, one of the most practical and often used method in order to handle count data when the variance is appreciably greater than the mean is the negative binomial (NB) model (Wang et al., 2005; Martin et al., 2006; Denkinger et al., 2012; Fisher et al., 2015; Kang & Xiang, 2017). Although the NB model deals with unobserved individual heterogeneity, it does not take into account the excess zeros in the data (Sari, 2009), which indicate the necessity of using Zero-inflated Poisson (ZIP) or Zero-inflated NB (ZINB) models (Maresova & Vokoun, 2013). These models assume that the population is divided into two groups with varying probabilities: the first group (with "excess" zeros) encompasses those individuals who do not use any health care services (for which the logistic distribution is considered), and the second group includes the potential users (for which the Poisson and NB distributions are considered). In other words, while the logit model predicts the probability of being in the non-user group, the Poisson or NB regression model estimates the numbers of healthcare services utilized among potential users.

3.2. Specification tests

In order to test the assumptions imposed by different estimation methods, several specification test are employed. A first step is to test if the unobserved individual heterogeneity accounts for overdispersion, which involves testing the null hypothesis according to which the dispersion parameter in NB model is equal to zero (Sari, 2009). As a second step, the Poisson and the NB models are compared using a likelihood ratio (LR) test. Finally, one needs to test if the overdispersion is also due to excess zeros, which implies the comparison between Poisson, NB, ZIP, and ZINB models. For this purpose, the specification test developed by Voung (1989) is performed. For a given critical value, usually of 1.96, if the calculated value of the test is positive and higher, then ZIP (or ZINB) model is preferable to Poisson (or NB) model. Otherwise, if the test value is negative and lower than the negative critical value, Poisson (or NB) is the more appropriate model to use.

4. RESULTS

1.1 Descriptive statistics

Table 2 presents the mean and standard deviation for dependent variables, and Table 5 (in the Appendix) provides the summary statistics for all independent variables included in the regression models.

Table 2 Descriptive statistics for dependent variables

Variable	Mean	Sd
Nb_Nights_hospit	0.39	1.83
Nb_Days_hospit	0.03	0.25
Nb_Generalist	0.28	0.51
Nb_Specialist	0.06	0.27
Nb_Prev_services	1.11	1.38

Note: SD stands for standard deviation.
Source: Authors' computation

As shown in Columns (2)-(3), the sample variance for each dependent variable is significantly higher than the mean, indicating the presence of overdispersion. Thereby, the assumption of equal mean and variance in the Poisson model may not hold for our data set.

1.2 Specification tests

Table 3 provides the results for the specification tests that enable to choose the more appropriate model used for modelling the relationship between each type of health care services and the level of physical activity, controlled by the above-mentioned core variables (Section 2.2.3).

Table 3 Specification tests

DEPENDENT VARIABLES	ESTIMATES OF DISPERSION PARAMETER IN NB MODELS		NB *vs.* POISSON	ZIP *vs.* POISSON		ZINB *vs.* NB	
			LR test	V test		V test	
Nb_Nights_hospit	4.5637	***	922.108	-34.997	***	-19.470	***
Nb_Days_hospit	3.3893	***	125.764	-10.931	***	-10.945	***
Nb_Generalist	15.570	**	123.734	-4.9749	***	-38.759	***
Nb_Specialist	0.9815	.	61.578	-3.8847	***	-15.746	***
Nb_Prev_services	37.094	***	2605.77	-57.541	***	-56.076	***

Notes: (1) NB denotes the negative binomial model; ZINB and ZIP stand for zero-inflated negative binomial and zero-inflated Poisson models, respectively; LR test and V test stand for Likelihood Ratio test and Voung test statistics, respectively. (2) *** indicate the rejection of null hypothesis for 1%; ** indicate the rejection of null hypothesis for 5%; * indicate the rejection of null hypothesis for 10%; (3) the value of LR test is calculated based on two times the difference between the log-likelihood of NB model and Poisson model, then it is compared to a critical value corresponding to an asymptotic Chi-square distribution with one degree of freedom (in our study the critical value is of 1.96).
Source: Authors' computation

The test statistics and estimates for dispersion parameter in all NB models are presented in Column (1) and supports the previous assertion stating that overdispersion is due to individual heterogeneity. Irrespective to the dependent variables, the outcomes presented in Column (3) suggest that NB model is preferable to Poisson model, as the values of LR test statistics are all higher than the corresponding critical value of 1.96. Moreover, the values for the test statistic V (Column 4-5) are negative and lower than the critical value of -1.96, supporting the view that the NB model is preferable to all other alternatives, including ZINB model. Therefore, the excess zeros in the data do not accounts for overdispersion.

1.3 Main results

Considering the findings related to the specification tests from the previous section, full estimations from the NB regression model are reported in Table 6 (Appendix). The results of the regression analyses provide the expected health care utilization differences between the category of each independent variable and its corresponding reference group among users of healthcare services.

Focusing especially on the relation between physical activity and each health care services, the negative signs of the statistically significant coefficients in the NB model (Table 6 in Appendix) emphasize that both moderately and high active people use less inpatient (both overnight and day hospitalization) services, fewer generalist and specialist physicians' consultations, and less preventive services than their low active counterparts. In order to have a direct interpretation of these results, the incidence ratio rates (IRR) are computed (Table 4).

Table 4 Negative binomial regressions

Variables	NUMber of nights in hospital (Model 1)		NUMber of DAYS in hospital (Model 2)		NUMber of visits to generalist (Model 3)		NUMber of visits to specialist (Model 4)		NUMber of preventive services (Model 5)	
	IRR		IRR		IRR		IRR		IRR	
PA_Moderate	0.5896	***	0.4377	***	0.7708	***	0.6256	***	0.8329	***
PA_High	0.4188	***	0.4055	***	0.6059	***	0.6514	**	0.7912	***

Notes: (1) IRR stands for Incidence Ratio Rate and is obtained through exponentiation of the estimates corresponding to moderately active and high active groups (presented in Table 6, in Appendix). (2) *** indicate the rejection of null hypothesis for 1%; ** indicate the rejection of null hypothesis for 5%; * indicate the rejection of null hypothesis for 10%.

Source: Author's computation

Explicitly, the findings reveal that, among users of health care services, respondents reporting the moderate level of physical activity are more likely to spend 41.1% (IRR=0.589) less nights and 56.2% (IRR=0.438) less days in hospital, and also to have 22.9% (IRR=0.771) fewer generalist and 37.4% (IRR=0.626) fewer specialist physicians consultations. Furthermore, the results obtained show that expected preventive services utilization decrease by a factor of 0.833 (IRR) for moderately active individuals compared with the reference group of low active respondents. Being highly active is significantly associated with 58.1% (IRR=0.419) fewer nights and 59.5% (IRR=0.405) days spent in a hospital in previous 12 months, 39.4% (IRR=0.606) and (IRR=0.651) less visits to the generalist and specialist physicians, respectively, in the past four weeks. In addition, high active individuals incurred significantly lower utilization of preventive services, with approximately 21% (IRR=0.791) less than their low active counterparts.

2. CONCLUSIONS AND DISCUSSIONS

The study main findings show that physical activity level is negatively associated with the amount of health care utilization, suggesting that, on average, high and moderately active people use significantly fewer health care services compared with low active people. Though these findings are more or less consistent with results from earlier papers (Sari, 2009; Maresova and Vokoun, 2013; Fisher *et al.*, 2015; Kang & Xiang, 2017), the outcomes related to the use of preventive services are, to some extent, in contradiction to the literature studying the link between physical activity and health care utilization. In this respect, Kang & Xiang (2017) argue that people who are physically active and use preventive services could be more health conscious compared to those who are physically inactive or those who do not use preventive services regularly. Nevertheless, to some extent, these results should not be interpreted separately from other health care services. Specifically, considering the fact that the services we included for computing the corresponding index (*i.e.* the number of preventive services use in the previous 12 months) are normally recommended by a generalist or specialist physician, it could explain the negative impact of physical activity on using preventive services, as it is less likely for a more physically active individual to consult either a generalist or a specialist physician.

Considering the impact of the control variables on the use of health care services, the outcomes indicate that, among the socio-economic and demographic characteristics of respondents, age is one of the most important factor, with a positive impact on the use of health care services (excepting the number of days spent in hospital). In other words, adults and particularly older people are more likely to use more health care services than adolescents. Being unemployed, and self-employed in some cases, or a widower is also significantly related to a higher number of services used. Income levels, especially the higher ones, have a significant positive impact, but only on the number of visits to generalist and specialist physicians and the number of preventive services used. In contrast, being either unmarried or from an intermediate- or thinly-populated areas is associated with fewer number of both specialist and generalist consultations, and less preventive services used. It is noteworthy that education level has a significant, but negative, impact only on the number of specialist services, suggesting that individuals corresponding to secondary and tertiary levels in terms of education are more likely to use fewer specialist consultations, but are no more or less likely to be high users of other health care services.

As for the health behaviour factors, the obese group of BMI status is significantly related to the higher number of nights and days spent in hospital, to the higher number of contacts with a generalist physician, and to the higher number of preventive services used, while a sufficient level of fruits and vegetables consumption is associated with the higher number of visits to a specialist. Regarding the lower utilization of health care services, the low risk profile of alcohol consumption is associated with the number of nights spent in hospital and the number of preventive services, while the increased risk profile of alcohol use is related to the number of days in hospital and the number of contacts with both a generalist and specialist physicians.

Our research results should, however, take into consideration some limits. Firstly, more physical activity measurement could be used for checking if the same results hold true. To pursue research on these findings, future follow-up studies of the Romanian population will include other measures on health care utilization, as well as another detailed assessment of physical activity. Secondly, our study does not account for respondents' health status characteristics, which might have been a source of heterogeneity. Therefore, other studies might further investigate to what extent such independent variables could affect the relationship between physical activity and health care utilization. Thirdly, the lack of data on health care expenditure does not allow an in-depth analysis of the impact of physical activity on reducing the health care related costs.

To conclude, interventions aimed at increasing physical activity may result in significant reductions in the demand for health care services, and indirectly in lowering the public health related costs. Thus, our paper provides important insights for policymakers about the potential impact of population-based strategies to increase physical activity participation among Romanian people on the health care utilization.

APPENDIX

Table 5 Descriptive statistics for independent variables

VARIABLE	MEAN	SD
PA_*Moderate*	0.6	0.49
PA_*High*	0.13	0.34
Sex_*Male*	0.47	0.50
Age_*Adult*	0.68	0.47
Age_*Elderly*	0.27	0.44
Education_*Secondary*	0.77	0.42
Education_*Tertiary*	0.11	0.31
Marital status_*Married*	0.60	0.49
Marital status_*Unmarried*	0.21	0.41
Marital status_*Widower*	0.14	0.35
Employment_*Self-employed*	0.13	0.34
Employment_*Unemployed*	0.52	0.50
Income_*Quintiles1-2*	0.20	0.40
Income_*Quintiles2-3*	0.20	0.40
Income_*Quintiles3-4*	0.20	0.40
Income_*Quintiles4-5*	0.21	0.41
Durbaniz_*Intermediate_area*	0.22	0.41
Durbaniz_*Thinly_area*	0.46	0.50
BMI Status_*Obese*	0.10	0.30
BMI Status_*Overweight*	0.47	0.50
Smoking_*Never*	0.76	0.43
Smoking_*Occasional*	0.05	0.22
Alcohol_*Increased risk*	0.19	0.39
Alcohol_*Low risk*	0.38	0.49
Nutrition_*Moderate*	0.35	0.48
Nutrition_*Sufficient*	0.52	0.50

Notes: (1) The reference categories for each independent variables are: *low active* (physical activity); *female* (sex of respondent); *adolescent* (age group); *primary education level* (education); *divorced* (legal marital status); *employed* (employment status); *lower than quintile 1* (income level); *densely-populated area* (degree of urbanization); *normal weight* (BMI status); *daily* (smoking); *no-risk* (alcohol consumption risk profile); *insufficient* (nutrition – fruits and vegetables consumption); (2) SD stands for standard deviation.
Source: Authors' computation

Table 6 Negative binomial regressions

Variables	NUMber of nights in hospital (Model 1)		NUMber of DAYS in hospital (Model 2)		NUMber of visits to generalist (Model 3)		NUMber of visits to specialist (Model 4)		NUMber of preventive services (Model 5)	
Intercept	-4.052	***	-6.178	***	-2.594	***	-5.187	***	-1.161	***
PA_Moderate	-0.528	**	-	**	-0.260	**	-0.469	**	-0.182	**

		*	0.826	*		*		*		*
PA_High	-0.870	***	-0.902	***	-0.501	***	-0.428	**	-0.234	***
Sex_Male	0.265	.	0.375	*	0.032		0.210	**	-0.064	*
Age_Adult	1.074	**	0.705		0.765	***	1.232	**	0.575	***
Age_Elderly	1.088	**	0.709		1.296	***	1.509	***	0.970	***
Education_Secondary	-0.248		-0.212		-0.144	***	-0.003		0.032	
Education_Tertiary	-0.327		-0.144		-0.205	**	0.066		0.115	*
Marital status_Married	0.506	.	0.934	*	0.033		0.172		0.160	**
Marital status_Unmarried	-0.311		0.234		-0.770	***	-0.709	**	-0.356	***
Marital status_Widower	0.733	*	1.068	*	0.154	.	0.310		0.244	***
Employment_Self-employed	-0.153		0.685	*	0.263	***	0.414	*	-0.055	
Employment_Unemployed	1.320	***	0.896	***	0.788	***	0.889	***	0.240	***
Income_Quintiles1-2	0.151		0.010		0.113	*	-0.056		0.211	***
Income_Quintiles2-3	0.193		-0.294		0.202	***	0.131		0.271	***
Income_Quintiles3-4	0.500	*	0.485	.	0.210	***	0.444	***	0.372	***
Income_Quintiles4-5	0.163		0.121		0.236	***	0.404	**	0.302	***
Durbaniz_Intermediate_area	0.465	**	0.639	**	-0.128	**	-0.184	.	-0.068	*
Durbaniz_Thinly_area	0.596	***	0.255		-0.165	***	-0.135		-0.102	***
BMI Status_Obese	0.943	***	0.742	**	0.319	***	0.237	*	0.310	***
BMI Status_Overweight	0.106		0.018		0.044		-0.019		0.057	*
Smoking_Never	0.063		0.271		0.066		0.133		0.160	***
Smoking_Occasional	-0.397		0.355		-0.255	*	-0.463	.	-0.022	
Alcohol_Increased risk	-0.413	*	-0.460	.	-0.379	***	-0.740	***	-0.044	
Alcohol_Low risk	-0.649	***	-0.366	*	-0.268	***	-0.446	***	-0.106	***
Nutrition_Moderate	0.510	**	0.387		0.040		0.267	.	0.109	**
Nutrition_Sufficient	0.744	***	0.621	*	0.221	***	0.779	***	0.190	***

Notes: (1) The reference categories for each independent variables are: *low active* (physical activity); *female* (sex of respondent); *adolescent* (age group); *primary education level* (education); *divorced* (legal marital status); *employed* (employment status); *lower than quintile 1* (income level); *densely-populated area* (degree of urbanization); *normal weight* (BMI status); *daily* (smoking); *no-risk* (alcohol consumption risk profile); *insufficient* (nutrition – fruits and vegetables consumption). (2) *** indicate the rejection of

null hypothesis for 1%; ** indicate the rejection of null hypothesis for 5%; * indicate the rejection of null hypothesis for 10%.
Source: Authors' computation

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