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RESEARCH OF ECONOMIC BURDENS LINKED TO PHYSICAL INACTIVITY

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ABSTRACT

Interest in monitoring living standards has gradually risen in our country in recent years. The National Development Plan's main goal was to increase living standards for the domestic population in the period between 2004 and 2006. Unfortunately, it couldn't reach its goal, and the Hungarian indicators' scores fall at the end of European ranking list, according to the WHO report of May 2010. The result of Eurobarometer's representative case of 2010 is depressing, showing that 77% of the population is physically inactive. This paper's objective was to produce numerical data of the economic burdens in sick-pay, furthermore to measure the costs could be saved in sick-pay with a decrease in physical inactivity. We have used national and international studies, reports, and methodologies in our research. We have accessed sources in the database of the National Health Insurance Fund Administration, and created our own questionnaire (n=1158). Our conclusions indicate that it is the responsibility of the decision-makers to take action to decrease physical inactivity so as to spare drastic expenses every year.
Keywords: physical inactivity, lifestyle, economic burdens, sick-pay allowances

INTRODUCTION

The European Committee has worked out a 10 year long strategy named Europe 2020 in March 2010. Its main goal was to put the European economy into growing orbit. The strategy urged the policies of the member states and the Unions better to co-ordinate, to give dynamics to the „intelligent, sustainable and inclusive economic growth". There were formulated a lot of key messages at the round table discussions of decision-makers, from which we would like to emphasize the following:

„The Europe 2020 Strategy shouldn't consider only GDP, but new indicators are needed, which measure the quality of life and sustainability of growing."

Economic growth is the highest in the countries with higher quality of life, so its development decreases the poverty increasing the performance of the national economy. One of the key factor of the quality of life is the state of health. *Barro* (1997) thinks the population's state of health one of the most important indicators of economic growth. *Suhrcke at al.* (2005a; 2005b; 2008) pointed out, that the increasing of life expectancy with one year induces a 4% economic growth based on Bloom's and Canning's results, so investing in health-development could advance sustainability. *Nordhaus* (2002) assessed the value of a saved year of life in 3 millions USD.

The interest in studying quality of life has increased in our country in the last years too, because main goal of the National Development Plan was the increasing of the Hungarian population's quality of life between 2004 and 2006. However this goal wasn't achieved, because the Hungarian indicators of health behaviour (smoking, alcohol consumption, physical inactivity) published by WHO are on the bottom of the European ranking list in May 2010.

The protective effects of physical activity and recreational exercises were by many domestic and international research supported (e.g. it has protective effect on chronic diseases, coronary and heart diseases, muscosceletal diseases, type 2 diabetes and any kind of cancer) (*Nocon et al.*, 2008). It contributes to the mental health through its antianxiety and mood improving affect. It is one of the most effective and cheapest tools of stress management (*Balogh et al.*, 2008).

Cost-effectiveness studies support, that preventing diseases with physical activity is cheaper, than health improvement with medicines (*Apor*, 2010).

Physical inactivity is responsible about 600,000 deaths in the European Union and leads to loose 5.3 million healthy life years because of disability and decay of health (*Edwards and Tsouros*, 2006).

Many Hungarian and international researchers studied physical activity and inactivity (*Weiss et al.*, 2000; *Martin et al.*, 2001; *Katzmarzyk et al.*, 2000; *Felderer et al.*, 2006; *Chenoweth*, 2005; *BHF National Centre*, 2007; *Ackermann et al.*, 2008). The domestic studies witness about the evincible advantages of physical exercises.

All of them assert, that the decrease of physical inactivity results positive changes in the indicators of health, quality of life, well-being and economy. *Gémes* (2009) asserts in her study based on Hungarostudy 2002 research (n=12 634), that a physically inactive people (who absolutely don't do sports) was much more on sick-list, he was unable to perform his job and he was in hospital more recent (*Table 1*).

Table 1

Comparison of Physically Active and Inactive Lifestyle from some Aspects

Unable to Perform their Work because of Illness	Physically Inactive People	Physically Active People	χ^2-Statistics' Significance
0 day	70.40 %	75.00%	<0.01
1-14 days	9.50%	9.10%	
15-29 days	4.00%	3.80%	
30 or more days	16.10%	12.10%	
How much time were you in hospital? (2001)			
No time	79.20%	84.40%	<0.01
1-5 occasions	20.00%	15.00%	
6 or more occasions	0.80%	0.60%	
How many days passed you in hospital? (2001)			
No time	68.50%	75.10%	<0.01
1-14 days	19.80%	18.20%	
15-29 days	5.70%	2.80%	
30 or more days	6.30%	3.90%	

Source: *Gémes*, 2009

International researches present the savings through decreasing of physical inactivity widely. The *Table 2* shows the studies with similar methodology.

Table 2

Benefits of Reducing Physical Inactivity in Different Countries

Land	Burdens of Physical Inactivity	Possible Benefits with Decreasing of Physical Inactivity
Austria	N/A	254 millions EUR
Norway	980 EUR/person/year	N/A
Finland	N/A	1,200 EUR/person
Switzerland	1.76 billions EUR	1.76 billions EUR (direct costs) + 910 millions EUR (indirect costs)
United Kingdom	N/A	8.2 billions £
USA	21.6 billions USD	1.3 billions USD (with 5% decrease of physical inactivity)
Canada	2.1 billions CAD	150 millions CAD (with 10% decrease of physical inactivity

Half millions early deaths are caused by physically inactive life style and obesity in the USA, which means minimum 100 billions USD health expenditures. (*Myers*, 2008)

Physical inactivity generated 24 billions USD losses in 1998, which was 2.4% of the health expenditures in that year (*Colditz*, 1999).

It is important to emphasize, that the measurement of the physical inactivity's economic burdens shows a great variance, so it is risky to do direct comparisons between lands, because other methodologies are used.

Estimations on total savings potential linked to physical inactivity were not made in Hungary.[1]

The in Hungary usually sounded sick-pay savings estimation based on a Hong-Kong study is absolutely not acceptable, because its basic figures are false. The reason is that the figure of sick-pay allowance – 31.5 billions forints – is an old figure (form the term 1996-1998) (*NHIFA*, 2007) However the decrease of physical inactivity makes it possible, savings to realize not only in sick-pay, but in other expenditures too, but this study didn't contain other calculations. It pointed only out, that the expenditures of health services (medicine, medical expenditures) would decrease, and a production-growth would be available in the national economy (days dropped out on workplaces, healthier society with higher production rate).

[1] The only one attempt was the paper of *Hécz* (2009), which studied the economic burden of illnesses linked to physical inactivity.

MATERIAL AND METHODS

There were two main goals of this study:

- to compile a nomenclature, which could help to calculate all the economic burdens of physical inactivity in Hungary;
- to calculate the savings in sick-pay allowances in our country.

We would like to calculate all the affects, value, price of usual physical activity on indirect ways in Hungary. Our first searches proved, that the notion of usual physical activity is defined always differently. We had to define this notion very strictly at the summarizing of the extremely scarce statistics as a consequence of this problem.

Because of the colourful definitions of physical activity we could consider only the measure of physical inactivity as basic figures (this is usually equally interpreted), because this meant the sedentary lifestyle and the lack of physical activity needed to prevention.

We handled the dates of Eurobarometer[2] 2005 and 2010, the official dates of National Health Insurance Fund Administration (NHIFA) form 2010 and Hungarian Central Statistical Office (HCSO).

We have to accept the fact, that frequencies of some illnesses are higher at the physically inactive population than at physically active population, when we are talking about the economic burden of sedentary lifestyle. So sedentary lifestyle is a risk factor.

We have to make clear before calculations, what costs of illnesses for Hungarian society are. For the first step we would like to map and collect all the economic burdens of physical inactivity for the national economy. It can be seen at the list of the nomenclature, that the costs are coming from three different places. We can speak about costs of government, employers and employees. The national and international literature has differentiated the direct and indirect costs too. *Table 3* shows the economic burdens of illnesses in Hungary in 2005.

Direct costs are all the cost, which are linked to healing (in- and outpatient treatments' costs of illnesses, medicines, keeling aids' costs, sick-pay allowances). *Indirect costs* mean the costs of absenteeism, however resource sacrifice is not here, so it is perfect, if we are talking about *indirect burdens*. Indirect burdens are the decrease of outcomes due to absenteeism on the side of the employers and the decrease of earnings on the side of the individual. Direct costs are governmental and individual burdens, indirect burdens are the cost of employers and society. Disability and illness allowances are two and a half part of the unemployed allowances and these costs are growing further after an OECD report.

The definition of presenteeism has appeared in the last decade, it means, that the employee goes to work, however he or she is ill and is not able to do his or her job with full intensity. Presenteeism could have higher costs, then absenteeism after some papers made in the UK. Absenteeism is linked to health problems usually, the two most frequent reasons are the muscoskeletal and respiratory diseases, but backache and the syndrome of repetitive strain injuries are frequent too. The

[2] Eurobarometer is a public opinion poll made by research firms in the member states of the European Union for the Committees for the EU twice a year. These polls have been published since 1973.

physical activity programs moderate the increase of health expenditures compared to the inactive persons at workplaces, in which the hospital treatments', heart diseases' and diabetes' expenditures decreased mostly (*Lu*, 2008).

Table 3

Cost of Illnesses in Hungary in 2005

	Economic Burdens of Illnesses in Hungary in 2005	Total Sum (million Ft)	Whose burden is it?
Direct costs	Medicine	323,958	NHIFA
	Family doctor treatment	54,829	NHIFA
	Dental treatment	21,603	NHIFA
	Outpatient treatment	112,850	NHIFA
	CT, MRI altogether	11,256	NHIFA
	Artificial kidney treatment	16,879	NHIFA
	House nursing	2,966	NHIFA
	Inpatient treatment	396,696	NHIFA
	High value treatments	5,878	NHIFA
	Patient transport	6,241	NHIFA
	Spa	4,710	NHIFA
	Governmental health expenditures	315,980	NHIFA
	Sick-pay allowances	97,024	NHIFA
	Disability pensions	242,900	CANPI
Private costs	Out-of-pocket expenditures	789,950	Employee
	Expenditures of absenteeism	70,349	Employer
Indirect burdens	Friction costs of absenteeism	177,172	Employer
	Earnings reduction due to sick-pay	52,088	Employee
	Friction costs of disability	25,386	Society
	Presenteeism costs	18,729	Society
	Total sum	2,747,444	

CANPI: Central Administration of National Pension Insurance
Source: Based on *Kollányi and Imecs*, 2007

The economic burdens of illnesses were 2,747 billions forint – which was more than 12.5% of the GDP – in Hungary in 2005. We had to change the estimation of *Kollányi and Imecs* (2007) at the calculation of indirect burdens, because we found their assumptions detached from the reality.[3]

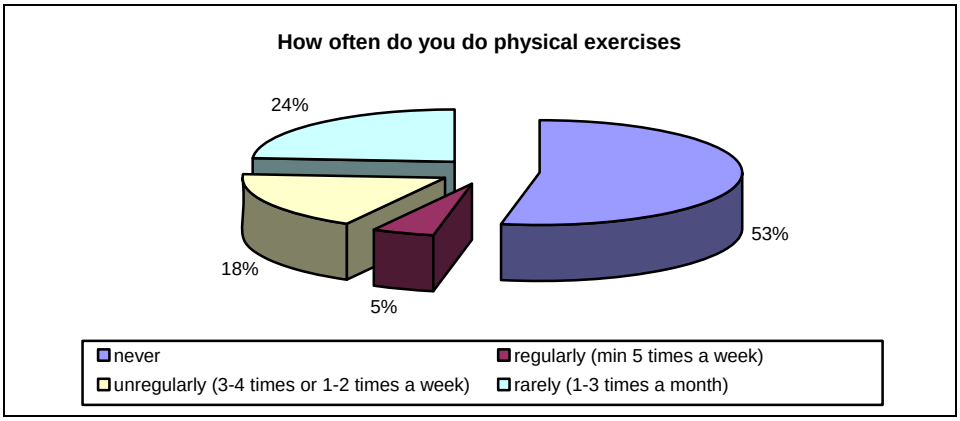
[3] Assumptions of *Kollányi and Imecs* (2007):
1. perfect market of goods, where the additionally produced goods will be absorpted;
2. imperfectly inflexible workforce market, where the dropped out workforce is not replaceable;
3. the basis of the loss is the gross average earnings per capita;
4. the employees work 365 days in a year;
5. the Hungarian employment structure is similar to the Dow Chemicals' headquarters in Michigan in 2002.

The good market and the workforce market of Hungary are supply dominated, the employees have to work 230 days usually yearly and it is much fairer, if we use GDP per capita as the basis of loss. We should disregard form the multiplicative affect of Dow Chemicals. The costs of illnesses were 273 billions forint regarding a 3 months long friction period[4] and taking into consideration the personal losses in 2005, which was more than 1.2% of the Hungarian GDP in that year.

The representative research linked to sport activities (*Eurobarometer*, 2005) showed, that 60% of Hungarian population was totally inactive in sport in 2005, however this rate was 53% with 7% fewer, than in 2009 (*Eurobarometer*, 2010) (*Figure 1*). The newest research is saddening, when we add the other category (1-3 times of doing sport) to the inactive category, because the rate decreases with this addition onto 77%. The reason of the addition is that these categories don't mean a protective affect on health.

Figure 1

Prevalence of Physical Activity in Hungary (n=1024)



Source: *Eurobarometer*, 2010

RESULTS AND DISCUSSION

For the first time we calculated the indirect burdens of illnesses for the years 2005 and 2009, to compare them (*Table 4*). Because the regular gross average earnings were the bases of the calculations, we had to eliminate the change of this factor between these two years. Because of this reason we used the real average earnings from 2005 on the basis of 2009 in both years. The difference between the two years was given by the structural changes – decrease of sick-days, decrease of disability pensioners under age limit – after this.

[4] It means, that the dropped out workforce can be replaced after 3 months (searching, selecting, training) by a new employee with similar performance. This assumption maybe overestimates the present situation.

Table 4

Indirect Costs of Illnesses in Hungary in 2009 and 2005 Based on Real Average Wages in 2005 (2009=100)

Indirect burdens	Values with the Real Average Earnings from 2005 (2009=100) and with Structure from 2005	Values with the Real Average Earnings from 2005 (2009=100) and with Structure from 2009
Regular gross average earnings	176,691 Ft	176,691 Ft
Number of sick-days	37,385,000	32,800,000
Average earning for one day	5,809 Ft	5,809 Ft
GDP per capita for one day	11,758 Ft	11,758 Ft
Frictional costs of product deficiency because of illnesses	219,795 millions Ft	192,839 millions Ft
Number of disability pensioners under age limit	465,797	422,695
Frictional costs of product deficiency because of disability	31,493 millions Ft	28,579 millions Ft
Earnings reduction due to sick-pay	64,620 millions Ft	56,695 millions Ft
Costs of presenteesim	20,634 millions Ft	20,634 millions Ft
Total sum of indirect burdens	**336,542 millions Ft**	**298,747millions Ft**

As the result of the calculation of indirect burdens in these two years we have got, that a 37,795 millions Ft decrease has been calculated in real values (2009=100%).

There could be more reasons of this. One of them is the decrease of physical inactivity and the increase of physical activity. We remark again, that 60% of the Hungarian population never done sports in 2005 and 53% didn't do it in 2009 (*Eurobarometer* 2005; 2010).

The 7% decrease of physical activity maybe manifested itself in better health status and less absence at workplaces (the value of sick-days per capita decreased with almost 1 day[5]), which resulted the decrease of indirect burdens on real values. (37,795 millions Ft)

After the list of illnesses' burdens we wanted to sum the sick-pay allowances linked to physically inactive lifestyle. The savings of sick-pay allowances linked to sedentary lifestyle's reduction is calculable using the valid methodology of international researches.

The methodology is the PAR-method (Population Attributable Risk) and its versions in most of the researches.

$$PAR = \frac{P \times (RR - 1)}{1 + P \times (RR - 1)} \quad (1)$$

The *Summary Relative Risk* (RR) means the number of the recipients of sick-pay allowances in the physically inactive population. *Prevalence* (P) means the prevalence of physically inactive population in the full population.

[5] Exactly with 0.87 day.

We made a survey research to determine the Summary Relative Risk. We were unable to make a representative research among the Hungarian adult population due to lack of time and resources, but we think our results suitable to estimate tendencies, because these are based on large sample. We used the classical paper and pencil method (n=383) and the online data recording (n=775) to create the primer database. The database consists of 1,158 records covering all the country.

We used logistic regression to calculate the Summary Relative Risk of sick-pay allowances with SPSS17 for Windows. We wanted to know, what chance of physically active population had, to avoid sick-pay allowances in the year 2009. We found significant relationship between regular sport activities and sick-days ($p=0.03$; $Exp(\beta)=0.760$).

This means, that the chance of getting sick-pay allowances decreased to 0.76 among the physically active peoples, or the people with regular sport activities have 24% lower chances to get sick-pay allowances (95% EXP (β) 0,59-0,97%), so this was our RR value.

After that we were able to calculate the PAR value (with a significance level of 95% for the lower and upper boundary and average value) used the frequency of physical inactivity published in *Eurobarometer* (2010). This value quantifies the affect of physical inactivity.

The results are shown in the *Table 5*.

Table 5

Calculation of Sick-Pay and Days of Sick-Allowances Assuming 77% Physical Inactivity

	Unit	PAR value		
		Lower boundary of RR	Average value of RR	Upper boundary of RR
PAR value of sick-pay allowances with the rate of 77% of physical inactivity	%	2.3	15.6	23.6
Number of sick-days linked to physical inactivity (total sum 32,800,000 days)	Days	754,400	5,116,800	7,724,400
Sick-pay allowances (total sum 102,842.2 billions Ft)	Millions Ft	2,365	16,044	24,220

This means, that 2.3%-23.55% of all the recipients of sick-pay allowances were physically inactive. 23.55% of all the cases are switchable to physical inactivity at a level of 77% physical inactivity among the full population in extreme fall.

After that we calculated the values of expenditures of sick-pay allowances used the dates of NHIFA (*Table 6*). The total sum of expenditures of sick-pay allowances were 102,843.2 millions Ft in 2009. When the rate of physical inactivity were not so high (77%), then 16 billions Ft could be saved with a hypothetical elimination of physical inactivity. The 10% decrease of physical inactivity could be a real aim of sport- and health politics in our opinion, which could mean a drastic saving in expenditures.

Table 6

Calculation of Sick-Pay and Days of Sick-Allowances Assuming 67% Physical Inactivity

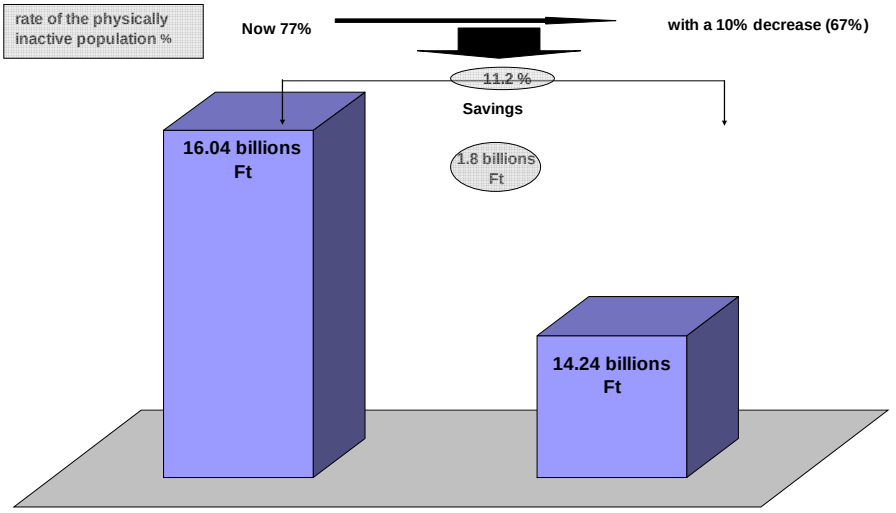
	Unit	PAR value		
		Lower boundary of RR	Average value of RR	Upper boundary of RR
PAR value of sick-pay allowances with the rate of 67% of physical inactivity	%	2	14	21
Number of sick-days linked to physical inactivity (total sum 32,800,000 days)	Days	646,290	4,543,625	6,932,492
Sick-pay allowances (total sum 102,842.2 billions Ft)	Millions Ft	2,026	14,246	21,737

The results show, that 14.25 billions Ft would be spared, if the rate of physical inactivity would be only 67%.

We subtracted the expenditures at the PAR value with rate 67% form the expenditures at the PAR value with 77%. This could mean hypothetically the savings potential linked to increase of physical activity at the NHIFA's expenditures in sick-pay allowances (*Figure 2*).

Figure 2

Savings in Sick-Pay and Sick-Allowances



That means, that 1.8 billions Ft could be saved with the 10% decrease of physical inactivity, which is 11.20% of all the expenditures in sick-pay allowances (the extreme values are 10.25% and 14.33%). On the other hand, it could mean a saving of 573,175 sick-days yearly.

After our calculation we can interpret, that sick-pay allowances are reducible with a significant measurement.

CONCLUSIONS

We were able to show, how important role physical activity could play in national economy and how significant savings would be possible with its increase on the level of society and the people too.

Austria, Belgium, Denmark, Finland and Norway use every effort to develop the employees' health on the level of government and workplaces too. These countries worked out concrete laws and policies to handle this question. It is proved, that health development programs don't remain ineffective (*Report of European Foundation for Development of Health- and Work Conditions*, 2010).

Based on foreign studies the well-organized exercise intervention programs can function with a good efficiency in the struggle against bad health state caused by disadvantageous socioeconomically status (*Abernathy et al.*, 2002). These prevention sport activities could be successful introduced in the economical underdeveloped regions too (*Gémes*, 2008).

New targeted programs could be worked out using our results and recognizing the cheap and positive affects of physical activity on quality of life and health (*Ács et al.*, 2010).

An important goal of preventive health politics should be the stimulation of social groups, communities, regions with disadvantaged socioeconomically status. A foreign study found through studying the past century that development of population's health status is responsible for 30-40% of economic growth (*Arora*, 2001).

The health status of the population can be proved with the increase of physical activity, which increases the productivity and decreases the social expenditures linked to health status. Economic growth is stimulated by this process, which improves the country's competitiveness.

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