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Research paper

Economic and public health benefits: The result of increased regular physical activity

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ABSTRACT

Introduction: This study aimed to evaluate mathematical algorithms that could quantify the burden of disease in Hungary and to determine the extent of savings in sick-allowance which could be achieved if inactive lifestyles could be reduced.
Methods: Data was collected from the Hungarian National Health Insurance Fund Administration, the Central Administration for the National Pension Insurance, the Hungarian Central Statistical Office, and a national large-sample survey (n = 1158). Direct costs and indirect burden of various diseases were analysed using economic and labour-related assumptions. The distribution of medical cost coverage between the state, households and employees is described, taking Hungarian commodity- and labour market specifics into consideration. We used the method of population Attributable Risk to quantify the possible savings in sick-allowance due to a reduction in inactivity.
Results: Comparison of economic burdens of illnesses between 2005 and 2009 decreased in inflation-corrected real terms. Expanding physical activity was a trigger factor, as logistic regression showed significant correlation between regular sporting activity and sick days of the previous year ($p = 0.03$; Exp (β) = 0.760). In 2009, 2.3%–23.6% of all workers applying for sick-allowance lived inactively, and 16 billion HUF in sick-allowances could have been saved had the population inactivity rate not been 77%. Calculation of illness-related burden relating to obesity, hyperlipidaemia, high blood pressure, stroke and type-II diabetes related to metabolic syndrome highlights specific areas where increased physical activity could have a positive effect.
Conclusion: Only a 10% increase in physical activity would result in more than 28 billion HUF (ca. 73.7 million GBP) savings for the Hungarian economy.

1. Introduction

Results of the 2012 Summer Olympic Games filled Hungarians with pride as the nation came 9th on the official medals table, overtaking several countries with more robust economies. Hungary is a nation of sports, but macro-economic and other indicators show a contrast between professional and recreational physical activity. There is a gap between "Hungary, the nation of sports" and Hungarian society as a sporting nation.

A Hungarian analysis showed that a 4% point growth of the sporting population may result in 1 percentage point growth in activity rate [1]. The Eurobarometer study suggests that the ratio of regularly active population as the proxy indicator of a sporting nation is significantly correlated to several variables (activity rate, GDP in PPS, household expenditures for sport and recreation, recreational land use), while it shows no correlation with the success indicators analysed in this study (number of gold medals, all medals and rank on medals table at the 2012 Summer Olympics) [2].

The same study suggests that around 77% of the Hungarian population can be considered physically inactive (PI). Formulating the PA segment of Hungarians, 3% of the society had registered at their doctors' office for sporting approval in 2007 [3]. The segment of athletes in competitive sports has recently expanded, currently being around 7–8%. Considerably more people do recreational sports – their volume is most often estimated by intensity of physical activity [4]. Another indicator is the use of land for recreational purposes, which is 4.2% on average in the EU, and slightly less, 3.05% in Hungary [1].

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There is a strong positive correlation between life expectancy and the ratio of PA population (citizens who claim "never to do sports" are not considered), described by the rank correlation coefficient ($\rho = 0.8$). This illustrates that life expectancy is generally higher in countries with higher rate of PA population, resulting in more healthy life years, measurably better quality of life, better economic performance, and faster growth. The correlation between state of health (as a key factor of quality of life) and national economic performance is so strong, that Barro considers the population's state of health as a primary indicator of economic performance and growth [5]. Furthermore, Suhrcke reveals that an increase of a population's life expectancy by one year could induce an economic growth of 4% in a given country [6,7]. Nordhaus estimates the value of one extra year of life to be 3 million USD [8]. Other studies estimate that physical inactivity is responsible for approximately 600,000 deaths in the EU, reducing healthy years of life by another 5.3 million as a result of premature disability and degradation of health [9]. In the meantime, research by Anokye et al. showed that brief advice from the general practitioner is a highly cost-effective tool to promote physical activity among adults. [10] Specific age groups at risk is also worth considering, as Corder et al. prove the unexpected threat adolescents face due to decreasing physical activity [11].

Several Hungarian research projects have had the similar conclusion that quality of life was also increasing in the country. 2010 WHO statistics put Hungary at the bottom end of the European list in terms of negative health behaviour indicators (e.g. smoking, alcohol consumption, inactive life style), as the protective effects of regular and recreational physical activity against chronic-, cardiovascular-, and locomotor diseases, diabetes and specific types of tumour have been shown scientifically. Sport also supports the maintenance of psychological health through reducing anxiety and improving mood, consequently improving quality of life, is one of the most effective and cheapest tools to manage stress. Based on the large sample (n = 12,634) health care survey "Hungarostudy 2002", Gémes states that PI participants were more often unable to perform their jobs, had to apply for more sick-allowance and had to be hospitalized more than PA respondents [12].

A broad spectrum of international studies have illustrated the savings they can be achieved by a reduction in inactivity. Half a million premature deaths annually are attributed to inactive life style and obesity in the United States, which result in at least 100 billion USD in health care expenses [13]. Previous research highlighted that the lack of recreational physical activity generated 24 billion USD loss (at the dollar rate of 1998), which represented 2.4% of health care expenditures at the time [14].

The Hungarian estimation on the comprehensive cost savings achievable with the reduction of inactive life style have yet to be calculated. The Sport XXI. National Sports Strategy is the only document to indicate that by increasing the proportion of PA population from 10% to 15% Hungary could realize savings of 1.1 billion HUF annually [15]. This obsolete calculation is updated in our current work.

The aim of this study was to evaluate mathematical formulas that could numerically describe the burdens of disease in Hungary, and also to determine the extent of savings in sick-allowance achievable by reducing inactive life styles.

2. Methods

Our initial task was to clarify the diverse scientific definition of physical activity. We took physical inactivity as a starting point, referring to the inactive life style and lack of physical activity required to maintain health.

Data was used from the 2005 and 2010 Eurobarometer study; the database of the Hungarian National Health Insurance Fund Administration (HNIFA) and the Central Administration for the National Pension Insurance (CANPI) for 2009; and the database of the Hungarian Central Statistical Office. Furthermore, a national large-sample survey (n = 1158) was conducted to provide more insight on specific questions.

Costs of inactivity were analysed based on the national economic burdens of various diseases. On a national economic level, diseases may have direct costs and indirect burdens. Calling the latter "indirect costs" in case of diseases and inactivity is invalid, since there is no resource input, thus no cost of any kind as a result of the missing work is produced. However, the missing production does come up as a loss for both the economy and the society, hence it is treated as a burden.

The following Hungarian economic circumstances were integrated into the assumptions: the labour market is over-supplied and suffers from frictions; the commodity market is over-supplied; companies' performance expectations are based on teams; an average person works 230 days per year; and the basis of loss is the GDP per capita. Our analysis was inspired by Kollányi and Imecs's similar calculation, although assumptions, formulas and data was updated, thus there is practically no congruence between the two studies other than sick-allowance data [16].

The bulk of direct medical costs are covered by the Hungarian government through NHIFA as social security, including medications, hospital care, treatments and sick-allowance. Other proportions of such costs are connected to the households' expenditures, on health-care products, outpatient care and gratuity. Companies as employers cover the rest of the direct costs through paying sick leave without compensation. This amount is presumably underrated in the current analysis as data only on the obligatory sick leave prior to the sick-allowance was available (those cases where the worker is on such a short sick leave that they do not apply for sick-allowance was not considered).

Regarding the indirect burdens, the loss of production caused by illnesses or disability is calculated first, presuming a 6-month friction period (i.e. the amount of time an employer needs to search, select and train replacement labour). The Hungarian labour market is generally heavily over-supplied, and while both the individual and the corporate level may provide cases where the above assumptions do not hold true, we may well overestimate the friction period.

It is also crucial to take commodity markets into consideration, since the economic performance of companies does not depend on the workers' output volume but on the market sales of the products and services provided by the given company. Commodity markets' significant over-supply establishes no guarantee that the additionally manufactured products and service can be sold. Also, company performances are not based on the individual level, but on the organisational unit: during a worker's short leave his performance will be compensated by other team-members (mostly with continuous, unpaid, and overtime work). Annual working days were defined in 230 days, deducting holidays and vacations. The basis of production loss is the GDP per capita, being the most reliable aggregate measure based on the added value on the national level. The companies performance distribution was not included in the current analysis. Should we consider the average daily wage only, the income of the company would be disregarded. Decrease in wages due sick-allowance also appears as economic loss. Another economic burden is presenteeism, a worker attending his job when sick, thus performing less effectively. At this point, realistic losses are accounted for only in positions of sales or partner relations, due to general team-level organisational expectations.