

## Sleep time in the time use survey

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### Abstract

We spend about one-third of our life on sleeping which is essential for physical and mental health. Researches verified that both too much (above 8 hours) and too little sleep (under 7 hours) affect the state of health unfavourably, while the golden mean seems to be ideal. Sleep time forms an U-shaped curve over the life span. Younger people and the old sleep more, whereas the middle generation spends less time on sleeping. Women sleep somewhat more than men and sleeping has a relation with family lifecycle, with working time and with income, as well. In our overdriven lifestyle we can observe the conversion of sleep time to waking activities. In addition, some dimensions of the social inequality may influence the sleeping habits. In the analysis of lifestyle some crucial evidences can be furnished from time use surveys. Investigations of these points and relations are based on the data of Hungarian time use survey 2009-10.

Keywords: time use, sleeping, health, lifestyle

### Section 1 Introduction

Everyday experience and researches show that sleep is essential for physical and mental health (Kriptke et al. 2002, Metlaine et al. 2005) as well as for productivity at workplace (Metlaine et al. 2005, Hale 2005, Hurst 2008, Hale and Hale 2010). Neither too long (more than 8 hours), nor too short (much less than 7 hours) sleep is conducive to the physical and mental health. The ideal sleep duration is somewhere in the middle range. Beside the duration the quality of sleep is also determining, and in addition to that, it seems the latter is at least as important as the former. While the duration of sleep can be measured easily in the time use surveys, the quality cannot. Mostly the interruption of sleep can be grasped (Burgard 2011) and recently some time use data collections also record the subjective value of the action judged by the respondent (Ricroch 2011). However, these solutions do not represent the insomnia, though it is quite a common phenomenon (Leger et al. 2000). The insomnia is not equal to short sleep. (Often people with insomnia lie in bed without sleeping. This activity is recorded mostly as sleeping in the time use diary. This is one of the reasons for which time use surveys overestimate the time spent on real sleeping.) Metlaine et al. (2005) discuss in detail the possible and empirically proven socio-economic consequences of insomnia.

Although length of sleep is mostly biologically determined, it is remarkable that some effect of certain social factors is detectable. Following Jeffrey Alexander's (1987) meta-theoretical concept there are two theoretical traditions in research on sleep time. One of them is rational (methodological) individualism (i.e. voluntarism) and the other is methodological collectivism. Some of the researches emphasize that people make their best to exploit individual opportunities and the management of time plays an important role in this process. Other researches address the restrictive aspects of social structure.

Biddle and Hamermesh (1990) studied the relationship between working time and sleep time and were the first to indicate that the higher incomes among men were existing along with a shorter sleep time. In case of women this effect was very weak. The negative relationship between sleep time and education as well as income was studied later by others, too (Szalontai 2006). These studies assume that time is a resource of limited availability so the management can be described on the basis of the

rational choice theory (Becker 1965, Robinson 1987). According to this school of thought the duration of sleep is influenced by monetary incentives. If the marginal cost of sleep is high enough, people will choose being awake, or to be more precise, an income-generating activity instead of sleeping. However, this is limited by the fact that sleeping is essential for the production of energy required for waking activities. So people cannot exploit themselves infinitely, because there is a threshold, and over that, productivity will decline. This concept of sleep can explain many relationships found earlier, e. g. why sleep time by age shows an U-shaped curve or why women sleep slightly more than men in most countries while they have a lower mean wage.

Dinges et al. (2005) examined on the annual data of 2003 of American Time Use Survey, to which other activities sleep time is the most reciprocally related. According to them, sleep is regarded as a flexible temporal commodity which can be converted to other waking activities. The results show that sleep time had the strongest reciprocal relation with the working time, and the following two powerful factors were the travel time and the time spent on housework. An extended version of the same research was published by Basner et al. (2007).

Unlike the previously mentioned authors, Hale and Hale (2010) highlight the social structural determination of poor sleep beside the individual (biological or behavioural) reasons. The lack of autonomy converts social inequities to health inequality through the mechanism of poor sleep. In this concept sleep quality is also an indicator of the health status. The authors argue that limited autonomy (or lack of autonomy), which can be identified at least roughly as low-level positions in social inequality (e.g. poor housing, low educational level, unemployment), leads to poor sleep. At a first glance, this seems to contradict the previously mentioned negative correlation between the education (or income) and the sleep duration. However, the poor sleep does not necessarily imply a short sleep. As earlier studies demonstrated, the relationship between sleep and health is not linear, but rather U or even more J-shaped. The duration of sleep is acceptable in a relatively wide range and the health risk of too long (more than 8 hours) sleep is even higher than that of a too short (7 hours) one (Kripke et al. 2002). In this concept the unemployment resulting from low education, or even the voluntarily chosen inactivity – which is caused by the poor income opportunities – are structural constraints and not the results of freely chosen factors, leading to passivity and ultimately to a deterioration of health status. This deterioration is accelerated in case of the insomnia by disfunctional answers, e. g. alcohol-use, tv-watching and sleeping pills (Metlaine et al. 2005). Burgard and Ailshire (2009) investigated the impact of social stratification on sleep through bad work conditions (low control, perceived job insecurity and feeling upset on job). According to their results, being bothered or upset at work is one of the three factors that mostly impair the quality of sleep.

However, the quality and quantity of sleep can be examined not only as response variable. Deterioration in the quality of sleep may cause the decline of the productivity at work (Metlaine 2005). Therefore, the relationship between work and sleep is circular in nature. Poor working conditions (shift work, night work, work-related stress) can result in poor sleep, while in the long run, lack of sleep will cause weak job performances, higher rates of absenteeism and will increase the risk of accidents.

## **Section 2 The current study**

On the basis of the two mentioned theoretical traditions I wish to examine whether the management of time in the individual life or the structural theory is more closely supported by the data of the Hungarian Time Use Survey 2009-10.

On the basis of the economic theory of sleep we expect that the higher level of education and the stronger embeddedness in the labour market reduce the time spent on sleep. A linear relationship is presumed and it is also anticipated that women sleep

slightly more than men, and young people and older people, that is, age-groups outside the active age, also sleep more than those of active age.

On the basis of the structural theory we expect that the social groups with a lack of autonomy (or with a low autonomy) have poor sleep, i. e. their sleep length is either too short or too long, an abnormal duration anyway. Typically these groups consist of people with low levels of education, poor dwelling conditions and of a status economically inactive or unemployed. However, a less strict definition of the structuralist theory will also be confirmed if not the most educated people sleep the least.

**Section 3 Data: The Hungarian Time Use Survey**

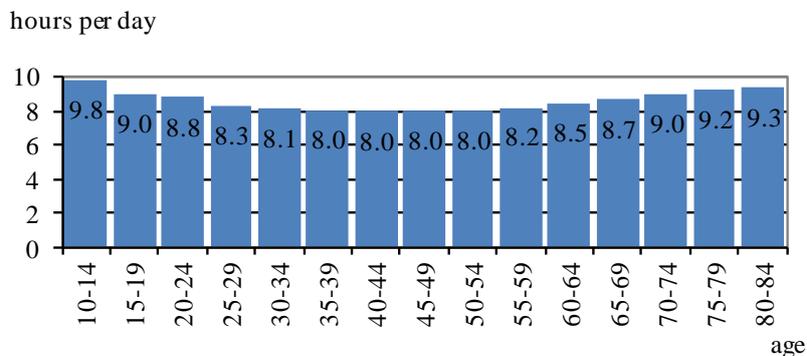
Time use survey in Hungary has a relatively long tradition. The first national data collection was implemented by the Hungarian Central Statistical Office (HCSO) in 1963. The first time use research in the framework of an international cooperation was headed by Hungarian sociologist Alexander Szalai between 1965-1966 (Szalai 1972, 1984) and HCSO had an important role in this.

The time use diary data have a privileged place in social statistics, since researchers try to grasp the full spectrum of lifestyle with these. There are many fields which could be examined only by special surveys in the absence of time use surveys. Nevertheless, the overall nature of the survey also has disadvantages. One such disadvantage is the estimation the amount of time spent on certain activities based on self-report, thus it has a subjective element compared to register-type data. Another drawback from the aspect of the issue is that only the length of the sleep can be examined, while the quality cannot. (Although recently it has become possible with the development of time-use survey techniques (Ricroch 2011).) Finally, it should be noted that compared to other (health or medical) data collections the real time spent on sleep is usually overestimated by time use surveys. The reason for this is that the actual sleep is not distinguished from time spent in bed with insomnia or from intervals of falling asleep or awakening. This is caused by the fact that the details of diary entry as well as the activity codelist are limited (Dinges 2005).

**Section 4 Descriptive results**

The sample of the Hungarian time use survey 2009-2010 represented the population aged 10-84 and consisted of 8391 persons. I publish weighted sample estimates for population total. Differences in mean sleep by gender and age were examined and then the analysis was restricted to the 25-64 year-old population similarly to Hale (2005). Thus, fewer interfering mechanisms (pensioners, students) had to be taken into consideration, but the unemployed and economically inactive people were not excluded from the analysis.

**Figure 1 Mean sleep time by age-groups**



Source: Hungarian Time Use Survey 2009-2010.

Sleep time by age is characterised by an U-shaped curve. Younger and older people tend to spend more time with this basic activity, while the middle generation spends less time on it. Women sleep slightly more than men. In the total population aged 10-84 women's mean sleep time was 8 hours and 33 minutes, that is, 8 minutes more than that of men. Women's sleep surplus disappeared in old age and around the age of 80 men sleep more, that was possibly caused by worse health status.

In Table 1 I summarized the mean sleep time (and standard error) broken down by the groups constructed by the most important explanatory variables. It also contains the distributions of the categorized version of respondent variables broken down by the different groups. The latter can be used to test the structuralist theory. According to this sleep duration changes not linearly but the rates of both long and short sleepers are expected to be higher in the groups of the persons with lower socio-economic status. I followed Hale (2005) in recoding a categorized sleep time variable.<sup>1</sup>

Women's sleep surplus in the population aged 25-64 was 7 minutes (their total sleep length was 8 hours 12 minutes). According to marital status married persons spend the least amount of time on sleep, followed by separated/divorced and single persons and the widowed sleep the most. Among the singles both short and long sleepers are over-represented, thus this social group is more prone to extremity. Mean sleep time changes to the reverse direction by educational attainment, however, the share of short sleepers is not the largest within the category of the highest educational attainment (ISCED4-6), but among those with a secondary education (ISCED3). Broken down by economic activity, employed persons sleep the least on the average and they are followed by the unemployed in the ranking. Economically inactive persons (pensioners, students, recipients of child-care benefits who care for their children at home and other dependants) sleep the most. The time spent on work (calculated in hours per week) unambiguously reduces sleep time. The mean sleep time of those who work less than 40 hours per week was 10 minutes longer than of those who work 40 hours a week and exceeds by half an hour the sleep time of those who work more than 40 hours a week. Among people living under unfavourable housing conditions<sup>2</sup> (which can be regarded as an indicator of living standards) I found an average of 12 minutes longer sleep and long sleepers are also highly over-represented. However, the share of short sleepers within this social group is not lower than in the total population. Average daily sleep time of those suffering from a chronic (outstanding for at least 6 months) disease is 17 minutes longer than that of the healthier majority and the long sleepers are over-represented, while the short sleepers are under-represented among them.

To sum it up, data support the exchange-theory hypothesis of sleep time converted to activities pursued awake (namely to work), but also allow the existence of other (structural) mechanisms. There are fewer short sleepers in the group with the highest education than in the one with a secondary education, even though we would expect the increase of the share of short sleepers along with higher levels of education. This may be due to the fact that a significant part of the those with a tertiary education is employed in the public sector in Hungary, where working time is fixed and

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<sup>1</sup> The boundaries of too short or too long sleep are known from medical researches and the author has drawn up his own categories on the basis of these (<6.5, 6.5-8.5, >8.5 hours per day). Taking into account that the time use surveys usually overestimate the real sleep duration, I shifted up the intervals by half an hour compared to those of Hale (2005). Thus we gain relatively narrow groups of still useable sizes on both edges of the distribution of sleep time: 19% sleep less than 7 hours, 24% sleep more than 9 hours and more than half of the sample was classified into the middle category.

<sup>2</sup> According to the definition of HCSO substandard dwellings are apartments without kitchen and of a full size of less than 50 sq. m or if one of the following characteristics is true: lack of toilet; lack of bathroom; lack of waste-water drain channel; lack of groundwork and the wall was built of adobe.

predictable, while those with a secondary education are mostly in the business sector, where working time is usually longer and home time-work time conversion is financially motivated. Another non-linear relationship is that although single persons sleep more than those married (presumably due to the extra burdens of having children), short sleepers are present also in a higher proportion among singles beside the over-represented long sleepers. This might be attributable to the fact that married persons are less characterised by being involved in night time entertainment (it is known that marriage has a protective effect against deviant behaviour (Berger and Kellner 1964)).

Of course a multivariate analysis may exhibit a more accurate picture. Further research on the topic is in progress.

**Table 1 Mean sleep time and the distribution of the categorized respondent variables by the different groups**

|                            | Means of<br>different group<br>(SD) | Short sleep (<7<br>h/night) n=1.0<br>million | Midrange sleep<br>(7-9 h/night)<br>n=3.2 million | Long sleep (>9<br>h/night) n=1.3<br>million |
|----------------------------|-------------------------------------|--|--|---|
| <b>25-64 population</b>    | <b>487.9 (101.8)</b>                | <b>18.6%</b>                                 | <b>57.3%</b>                                     | <b>24.2%</b>                                |
| Gender                     |                                     |  |  |   |
| Female                     | 491.5 (93.5)                        | 16.1%  | 59.5%  | 24.4%                                       |
| Male                       | 484.1 (109.8)                       | 21.1%  | 55.0%  | 23.9%                                       |
| Marital status             |                                     |  |  |   |
| Married                    | 483.1 (96.9)                        | 18.5%  | 59.3%  | 22.1%                                       |
| Single                     | 494.4 (111.7)                       | 19.7%  | 53.0%  | 27.3%                                       |
| Separated/<br>Divorced     | 491.7 (107.8)                       | 18.6%  | 55.0%  | 26.3%                                       |
| Widowed                    | 502.6 (92.8)                        | 14.0%  | 58.4%  | 27.5%                                       |
| Education                  |                                     |  |  |   |
| Below ISCED2               | 523.4 (107.0)                       | 10.7%  | 46.8%  | 42.5%                                       |
| ISCED2                     | 495.3 (104.7)                       | 17.0%  | 54.2%  | 28.8%                                       |
| ISCED3                     | 486.4 (104.0)                       | 19.8%  | 56.5%  | 23.7%                                       |
| ISCED4-6                   | 483.6 (91.7)                        | 16.8%  | 62.5%  | 20.6%                                       |
| Employment status          |                                     |  |  |   |
| Employed                   | 474.7 (106.1)                       | 22.4%  | 57.3%  | 20.2%                                       |
| Unemployed                 | 508.7 (95.0)                        | 13.5%  | 55.8%  | 30.6%                                       |
| Economically<br>inactive   | 512.5 (86.8)                        | 11.0%  | 57.7%  | 31.4%                                       |
| Working hours per week     |                                     |  |  |   |
| <40 hours                  | 488.4 (110.0)                       | 19.9%  | 56.0%  | 24.0%                                       |
| =40 hours                  | 477.6 (99.3)                        | 20.6%  | 59.2%  | 20.3%                                       |
| >40 hours                  | 458.5 (120.8)                       | 29.7%  | 52.2%  | 18.2%                                       |
| Quality of dwellings       |                                     |  |  |   |
| Substandard                | 498.9 (116.9)                       | 18.0%  | 52.4%  | 29.6%                                       |
| Standard or<br>higher      | 487.1 (100.6)                       | 18.6%  | 57.6%  | 23.8%                                       |
| Chronic diseases           |                                     |  |  |   |
| With chronic<br>illness    | 499.5 (100.1)                       | 15.1%  | 57.8%  | 27.1%                                       |
| Without chronic<br>illness | 482.2 (102.2)                       | 20.3%  | 57.0%  | 22.7%                                       |

The first column shows mean sleep times broken down by different groups. Standard errors are in brackets. The other three columns show the distributions of the main independent variables by amount of sleep.

Population aged 25-64.

## References

- Alexander, J. C. (1987) "Action and its environments", In: Alexander, J. C., Giesen, B., Münch, R., Smelser, N. S. (eds.) *The Micro – Macro Link*, University of California Press
- Becker, G. S. (1965) "A theory of the allocation of time", *The Economic Journal*, 75(299), 493-517.
- Berger, P., Kellner H. (1964) "Marriage and the construction of reality: An exercise in the microsociology of knowledge", *Diogenes*, 12(46), 1-24.
- Biddle, J. E., Hamermesh, D. S. (1990) "Sleep and the allocation of time", *Journal of Political Economy*, 98(5), 922-943.
- Burgard, S. A., Ailshire, J. A. (2009) "Putting work to bed: Stressful experiences on the job and sleep quality", *Journal of Health and Social Behavior*, 50, 476-492.
- Burgard, S. A. (2011) "The needs of others: Gender and sleep interruptions for caregiving", *Social Forces*, 89, 1189–1215.
- Dinges, D. F., Fomberstein, K. M., William, J. H., Razavi, F. M. (2005) "Time use for sleeping is relation to waking activities", working paper, were presented at the December 2005 ATUS Early Results Conference.  
<http://www.atusers.umd.edu/papers/Dinges.pdf>
- Hale, L. (2005) "Who has time to sleep?", *Journal of Public Health*, 27(2), 205-211.
- Hale, L., Hale, B. (2010) "Treat the source not the symptoms: why thinking about sleep informs the social determinants of health", *Health Education Research*, 25(3), 395-400.
- Hurst, M. (2008) "Who gets any sleep these days? Sleep patterns of Canadians", *Canadian Social Trends*, Statistics Canada Catalogue no. 11-008-X  
<http://www.statcan.gc.ca/pub/11-008-x/2008001/article/10553-eng.htm>
- Kripke, D. F., Garfinkel, L., Wingard, D. L., Klauber, M. R., Marler, M. R. (2002) "Mortality associated with sleep duration and insomnia", *Archives of General Psychiatry*, 59, 131-136.
- Leger, D., Guilleminault, Ch., Dreyfus, J. P., Delahaye, Ch., Paillard, M. (2000) "Prevalence of insomnia in a survey of 12778 adults in France", *Journal of Sleep Research*, 9, 35-42.
- Metlaine, A., Leger, D., Choudat, D. (2005) "Socioeconomic impact of insomnia in working populations", *Industrial Health*, 43, 11-19.
- Ricroch, L. (2011) "The enjoyable moments of day-to-day life. A question of activities - and their context ", *INSEE Premiere* online publication, INSEE  
<http://www.insee.fr/en/ffc/ipweb/ip1378/ip1378.pdf>
- Robinson, W. C. (1987) "The time cost of children and other household production", *Population Studies*, 41(2), 313-323.
- Szalai, A. (ed.) (1972) "The use of time: Daily activities of urban and suburban populations in twelve countries", The Hague: Mouton. Paris
- Szalai, A. (1984) "Cross-national comparative time budget research and the multinational time budget project", In: Harvey, A. S., Szalai, A., Elliott, D. H., Stone, Ph. J., Clark, S. M. (eds.) *Time Budget Research*. Campus Verlag. Frankfurt/New York
- Szalontai, G. (2006) „The demand for sleep: A South African study”, *Economic Modelling*, 23, 854-874.