Epidemiology of Smoking in the Hungarian Population, Based on National Representative Data

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Introduction: Our study reviews published assessments of smoking prevalence rates on Hungarian adult representative samples. *Aim*: To report the results of a national representative survey on the prevalence of smoking carried out in 2007 and to compare the results of the present survey with those of former studies. *Methods*: The target population was the entire Hungarian population aged between 18 and 64. Net size of the sample was 2,710 persons. Data collection partly used face-to-face interviews and more sensitive issues were assessed by self-rating questionnaires. *Results:* The 36.1% of the Hungarian adult population smoke cigarettes (29.9% on a daily basis), 40.6% of males and 31.7% of females smoke regularly (rates of daily smokers are 34.6% and 25.3%, respectively). Male gender, lower age, lower education, lower socio-economic status, and parental smoking were identified as risk factors for smoking. *Conclusions*: Present results show higher prevalence rates among the heterogeneous results of previous years, while suggesting a slight increase of smoking at the same time. This tendency is unequivocally owing to the increase in smoking among women; in men, stagnating prevalence rates can be observed.

Keywords: smoking, national representative sample, adult general population, gender differences, risk factors, Hungary

Introduction

Smoking is a serious public health issue in Hungary as in many other countries. Smoking is a major risk factor for a wide range of cancers, primarily lung cancer, laryngeal cancer, oesophageal, and oral cavity cancer, as well as cardiovascular diseases [1–4]. Smoking is one of the most important, though preventable, risk factors for these serious, often fatal, diseases. According to a WHO study of 2005, smoking is the greatest risk factor for Disability Adjusted Life Years for Hungarian women and men [5]. Women lose 15.2% of their healthy life years because of smoking, whereas men lose 25.5%. Smoking is therefore a major cause of premature death at an individual level; however, it has a major role in the enormous increase of disease burden at a social level as well. In 2004, costs of harmful effects of smoking and lost income in Hungary came to between 315 and 330 thousand million HUF [6]. This amount

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consisted of the direct expenses of smoking (e.g. outpatient and inpatient care, income lost because of illness, medicine subsidy) as well as indirect expenses of income lost as a result of premature death. Cigarette consumption has been increasing in the past decades. Whereas in 1970 the number of cigarettes smoked in a year was 2,940 for each smoker above the age of 15, between 1980 and 1982 this number increased to 3,320, and in 1994 it totalled between 7,611 and 8,697 cigarettes a year [7]. In 2002 smokers smoked 6,351 cigarettes a year on average, in 2004 5,913 cigarettes, and in 2007 6,022 cigarettes, a further increase [8].

The World Tobacco Atlas provides comparative data about the differences between different countries [9]. As regards males, Hungary is in the same group (40–49.9%) as, among others Portugal, Poland, Romania, Bulgaria, Slovakia, Latvia, Estonia, and Macedonia; the proportion of smoking men is lower in most of the west and north European countries than in Hungary. There is, however, a higher rate of male smokers in Greece, Ukraine, Russia, and Belarus. The situation is somewhat different in the case of females. Hungary is in the group with the highest rates; there is a worse prevalence in only two countries, Austria and Serbia. Countries with almost the same prevalence (30–39.9%) are Spain, Portugal, Greece, Denmark, and the Netherlands. Female smoking prevalence rates are, however, lower in most European countries than in Hungary, including Italy, France, Germany, the United Kingdom, Finland, Sweden, Slovakia, the Czech Republic, and Romania.

Health behaviour of the Hungarian adult population has been researched in several studies in the past decades; the results are, however, not always consistent. Before we report the main findings of our research, we provide a brief summary of the results of previous studies. Our review is limited to those national representative surveys which, similarly to our study, aimed at surveying the smoking habits of the adult population.

Summary of the Results of Previous Surveys

To our knowledge, the first study to examine smoking habits in a national representative sample of the Hungarian adult population was conducted in 1984 and was based on the 1984 microcensus conducted by the Hungarian Central Statistical Office (HCSO) [10]. Altogether 13 studies were found during a search of Hungarian publications and research databases *(Table 1)*.

These surveys examined somewhat different age groups. The majority of these surveys (eight surveys) focused on adult population, that is, people aged 18 and older. One study examined population at or above the age of 16, two HCSO surveys studied populations aged 15 or older, and another HCSO survey and one conducted by TÁRKI Social Research Institute in 1997 studied population at or above the age of 14. All were researcher-administered surveys.

Prevalence of smoking in the whole population is between 28% and 38% according to these studies; among females it is 20.7–31%, whereas among males it is 33.9–47%. According to these studies prevalence among women shows a tendency to increase in the past few years, though to a different degree. Whereas research studies of the population over the age of 18 in the 1990s showed the actual prevalence of smoking to be 21%, the five latest surveys estimated the prevalence of smoking among women to be between 22.8% and 31%. Results in connection with smoking prevalence among men are more heterogeneous. There is a remarkable difference between the results of two particular surveys, though neither of them shows a considerable change. According to the National Population Health Survey (NPHS),

Table 1 The prevalence of smoking among the Hungarian adult population in national representative surveys

				Prevalence of smoking (%) [CI95]		
Name of survey	**Year of data collection**	**Sample size**	**Age examined**	**Whole sample**	**Females**	**Males**
Based on the microcensus of HCSO in 1984 [10]	1984	n. a.	14–	33.2%	20.7%	47%
HCSO "Health Status 1986" [11]	1986	37,500	18–	32% [31.5–32.5]	n. a.	n. a.
Study about the state of mind in the Hungarian population [12]	1988	20,902	16–	n. a.	29% [28.1–29.9][a]	47% [46.0–48.0][a]
HCSO "Health status record" [13]	1994	5,476	15–64	35% [33.7–36.3]	27% [25.3–28.7][a]	44% [42.1–45.9][a]
TÁRKI 1997 [14]	1997	5 341	14–	n. a.	23.1% [21.5–24.7][a]	38% [36.1–39.8][a]
Heart Healthy Programme [15]	1997	3,000	18–	29% [27.4–30.6]	21% [19.0–23.0]	38% [35.5–40.5]
FACT Institute [16]	1999	1,200	18–	32% [29.4–34.6]	21.1% [17.9–24.3]	44.1% [40.0–48.2]
HCSO "Time balance" [17]	1999/2000	10,456	15–	30% [29.1–30.9]	26% [24.8–27.2][a]	40% [38.6–41.4][a]
National Population Health Survey (NPHS) 2000 [18]	2000	5,503	18–	32.4% [31.2–33.6]	26.1% [24.7–27.5]	40.3% [38.3–42.3]
Hungarostudy 2002 [19, 20]	2002	12,428	18–	28% [27.2–28.8]	22.8% [21.8–23.8]	34.9% [33.7–36.2]
Survey of lifestyle and health 2002 [21]	2002	1,987	18–	38% [35.9–40.1]	31% [28.2–33.8]	46% [42.7–49.3]
National Population Health Survey (NPHS) 2003 [22, 23]	2003	5,072	18–	33.9% [32.5–35.3]	27.9% [26.3–29.6]	40.7% [38.5–43.0]
Hungarostudy Health Panel (HHP) 2005 [24]	2005	3,701	18–	28% [26.6–29.4]	23.3% [21.5–25.1]	33.9% [32.5–36.3]

n. a.: data not available

[a] As no data were provided about the gender distribution, confidence intervals were estimated with a supposed gender distribution of 50–50%

the prevalence of smoking among males was 40.3% in 2000 and 40.7% in 2003, whereas, according to Hungarostudy, the smoking prevalence among men was 34.9% in 2002 and 33.9% in 2005.

The Aims of the Study

The aim of our study is to report on prevalence of smoking from the results of the National Survey on Addiction Problems in Hungary (NSAPH), which was a national, representative survey conducted among the Hungarian adult population in 2007, and also to compare these results with the results of the aforementioned former studies. Considering the contradictory results of the previous studies, we think our study can offer a valuable contribution to obtaining a clearer picture about the present state and current trends of smoking in Hungary.

Method

Sample

The target population of the survey was the entire population of Hungary between 18 and 64 years of age (6,703,854 persons). The sampling frame consisted of the population with a permanent address on 1 January 2006 according to the register at the Central Office for Administrative and Electronic Public Services (6,662,587 persons). Data collection was conducted in a representative sample of 3,183 people (gross sample size), stratified according to geographical areas, level of urbanisation, and age. The total number of strata was 186.

Data collection was conducted as a personal interview, with a so-called "mixed" method. Background variables and screening questions concerning each disorder were asked in a face-to-face interview technique, and symptom assessment scales were used as self-rating questionnaires. Data collection took place between 5 March and 6 April 2007. The net sample size was 2,710 persons (attained sample 85.1%). Questions concerning smoking were answered by 2,702 persons. In each category matrix weights were used to adjust the sample proportion in each stratum to correspond with the sampling frame. The weights employed had a normal distribution and there was only a small difference between them (standard deviation: 0.228; skewness: 0.639; standard error of skewness: 0.047; kurtosis: 2.397; standard error of kurtosis: 0.094).

Measures

The data collection battery used for this study consisted of almost 800 questions. The following subjects were included: substance use behaviour (smoking, alcohol, and drug consumption), behavioural addictions (pathological gambling, eating disorders, exercise addiction, work addiction, problematic internet usage, compulsive buying), socio-demographic data (gender, age, family of origin, education, employment status, economic status, household composition, value orientations/anomie, free time use) as well as personality dimensions.

In accordance with international practice, the following self-report indicators were used to measure the prevalence of smoking (possible answers are shown in square brackets, separated by semicolons):

Present smoking: "Do you smoke regularly or occasionally?" [yes, regularly (every day); yes, occasionally; no]

Intensity of smoking: "How many cigarettes do you usually smoke a day?" [… cigarettes; does not know]

Previous smoking: "Did you smoke regularly or occasionally in the past?" [yes, regularly (every day); yes, occasionally; no]

The focus of the present study is the prevalence and pattern of present smoking. In the analyses, *expected highest educational level* was used instead of the highest educational level; that is, educational level already obtained was adjusted depending on the present course of study being undertaken by the person. Deprivation index was applied according to Townsend's concept of multidimensional deprivation [25], which emphasises that material status of individuals and families should be measured with a complex set of life circumstances. The index applied in this study is based on 16 components of life circumstances [26]; it was calculated as the mean of answers to questions concerning the lack of each component because of financial constraints.

The methods of this research are described in detail in *Paksi and colleagues* [27].

Results

The prevalence of current smoking on a daily basis is 29.9% in the Hungarian population. There are an additional 6.2% occasional smokers. The mean number of cigarettes smoked in a day is 15.4 cigarettes (standard deviation 8.86).

More than half of the population (54.7%) had smoked some time during their lives; almost a third of previous smokers (17.9% of the population) do not smoke at present *(Table 2)*.

As regards gender differences, 31.7% of females smoke at present; a quarter of women do so on a daily basis (25.3%). The prevalence of present smoking is 40.6% in the case of males, and 34.6% are daily smokers. There is a significant difference ($\chi^2 = 23.062$; $p < 0.001$) between males and females in present smoking (regular or occasional smokers vs. non-smokers); the difference is a reflection of the difference in regular smoking ($\chi^2 = 27.539$; $p < 0.001$).

Females smoke 13.1 cigarettes a day on average (standard deviation: 7.49), whereas males smoke four cigarettes more, that is 17 cigarettes on average (standard deviation: 9.43). In connection with previous smoking, 14.7% of females ceased to smoke (previously regular or occasional smokers but non-smokers at present); in the case of males this rate is much higher (21.2%).

Regular smoking at present is lowest among the oldest and the youngest. Some 22.4% of the 55–64 age group and 26.9% of 18–24-year-olds smoke on a daily basis. The highest prevalence was found in the case of the 35–44 age group (37.5%). Occasional smoking, however, is most prevalent in the younger age groups; 11.2% of 18–24-year-olds and 8% of 25–34-year-olds are occasional smokers. The percentage of former smokers is highest in the oldest; 23.7% of the 55–64 age group and 22.8% of the 45–54 age group have ceased to smoke.

Smoking on a daily basis is highest among people with elementary education (42.9%), whereas it is lowest, at less than half of this (18.3%), among persons with higher education.

Regression models were employed in order to define the background of connections manifest in the above descriptive statistical data. These models were used to predict actual smoking status and intensity of smoking using sociodemographic and other background variables.

Table 2 Prevalence of present and previous smoking, according to gender, age, and educational level

	Prevalence of current smoking (%) [CI_{95}]			**Prevalence of previous smoking (%) [CI_{95}]**		
	Regular	**Occasional**	**Non-smoker**	**Regular**	**Occasional**	**Never smoked**
Whole sample	29.9% [28.2–31.6]	6.2% [5.3–7.1]	63.9% [62.1–65.7]	11.8% [10.6–13.0]	6.1% [5.2–7.0]	45.3% [43.4–47.2]
According to gender						
Men	34.6% [32.0–37.2]	6.0% [4.7–7.3]	59.4% [56.8–62.0]	15.2% [13.3–17.1]	6.0% [4.7–7.3]	37.5% [34.9–40.1]
Women	25.3% [23.0–27.6]	6.4% [5.1–7.7]	68.2% [65.7–70.7]	8.5% [7.0–10.0]	6.2% [4.9–7.5]	52.9% [50.2–55.6]
According to age groups						
18–24 years	26.9% [22.5–31.3]	11.2% [8.0–14.4]	61.9% [57.0–66.8]	4.8% [2.6–7.0]	5.8% [3.4–8.2]	50.7% [45.7–55.7]
25–34 years	27.9% [24.4–31.4]	8.0% [5.9–10.1]	64.1% [60.4–67.8]	8.3% [6.1–10.5]	7.3% [5.3–9.3]	47.8% [43.9–51.7]
35–44 years	37.5% [33.6–41.4]	4.4% [2.8–6.0]	58.1% [54.1–62.1]	10.4% [7.9–12.9]	5.1% [3.3–6.9]	41.8% [37.8–45.8]
45–54 years	33.5% [29.6–37.4]	4.5% [2.8–6.2]	62.0% [58.0–66.0]	17.3% [14.1–20.5]	5.5% [3.6–7.4]	38.4% [34.3–42.5]
55–64 years	22.4% [18.8–26.0]	4.0% [2.3–5.7]	73.6% [69.8–77.4]	16.9% [13.7–20.1]	6.8% [4.6–9.0]	49.5% [45.2–53.8]
According to expected educational level						
Elementary	42.9% [38.2–47.6]	5.1% [3.0–7.2]	52.1% [47.4–56.8]	10.4% [7.5–13.3]	4.2% [2.3–6.1]	37.1% [32.5–41.7]
Secondary	30.8% [28.6–33.0]	6.0% [4.9–7.1]	63.2% [60.9–65.5]	12.5% [10.9–14.1]	5.8% [4.7–6.9]	44.2% [41.8–46.6]
Higher education	18.3% [15.2–21.4]	6.9% [4.9–8.9]	74.7% [71.2–78.2]	11.1% [8.6–13.6]	8.4% [6.2–10.6]	54.6% [50.6–58.6]

The *first model* was created by means of a logistic regression method, with dichotomised actual smoking status as an outcome variable. The possible values of this variable were one (regular smokers at present) and zero (non-smokers). Occasional smokers were left out of the sample in this analysis. The model included sociodemographic variables, i.e. gender, age, expected educational level, net income per person, and deprivation index as predictors *(Table 3)*. It appears that regular smoking has a significant relationship with all the included variables. Females have a 34% smaller chance of regular smoking compared with males; the other variables in the model are controlled for gender (OR = 0.66; CI_{95} = [0.53–0.82]). The

Table 3 Results of the regression models

Outcome variables					
Current smoking status (non-smoker vs. regular smoker)			**Intensity of smoking (number of cigarettes smoked a day)**	**Intensity of smoking (light vs. heavy smoker)**	
Predictor variables	**OR [CI_{95}]**	**Wald^2 *(p)***	**β coefficient *(p)***	**OR [CI_{95}]**	**Wald^2 *(p)***
Model 1			**Model 3**	**Model 4**	
Gender	0.66 [0.53–0.82]	14.372 (<0.001)	–0.26 (<0.001)	0.46 [0.32–0.65]	18.575 (<0.001)
Age	0.98 [0.97–0.99]	14.634 (<0.001)	0.12 (0.005)	1.02 [1.00–1.03]	4.082 (0.043)
Expected educational level			–0.23 (0.604)		
Higher	Ref.	21.698 (p < 0.001)		Ref.	4.503 (0.105)
Secondary	1.85 [1.34–2.56]	13.793 (p < 0.001)		1.76 [0.97–3.18]	3.511 (0.061)
Elementary	2.59 [1.73–3.88]	21.370 (p < 0.001)		2.08 [1.04–4.13]	4.333 (0.037)
Net income per person	0.99 [0.99–1.00]	4.669 (0.031)	–0.13 (0.004)	0.99 [0.98–1.00]	6.405 (0.011)
Deprivation index	1.09 [1.05–1.12]	26.750 (<0.001)	–0.05 (0.315)	0.95 [0.90–1.00]	4.443 (0.035)
Nagelkerke $R^2 = 0.10$			Adj. $R^2 = 0.086$	Nagelkerke $R^2 = 0.10$	
Model 2					
Smoker parent or family member	3.47 [2.72–4.43]	99.771 (<0.001)			
Nagelkerke $R^2 = 0.13$					

[a] Gender, age, educational level controlled for

odds of regular smoking decrease with age as well, though not to a great extent (OR = 0.98; CI_{95} = [0.97–0.99]), and in the case of higher net income per person (EH = 0.99; CI_{95} = [0.99–1.00]). With regard to expected educational level (elementary, secondary, higher), in both the

case of secondary (OR = 1.85; CI_{95} = [1.34–2.56]) and elementary education (OR = 2.59; CI_{95} = [1.73–3.88]) the odds of smoking increase compared with higher education. The increase of the deprivation index increases the chance of regular smoking (OR = 1.09; CI_{95} = [1.05–1.12]).

In the second model, which was also created by means of logistic regression analysis, we wanted to examine whether actual smoking status could be predicted from smoking in the person's family. The outcome variable was the variable of present smoking status defined in the first model. In this model, gender, expected educational level, and age were controlled for. The results show that those who have a present or former smoker in the family (one or both parents or any other family members) have a 3.47-fold risk of being regular smokers, compared with those whose families consist of only present and former non-smokers (OR = 3.47; CI_{95} = [2.72–4.43]).

In our third model a linear regression analysis was employed to examine intensity of smoking; only daily smokers were kept in the sample. The aim of the analysis was to predict the number of cigarettes smoked per day from the sociodemographic variables mentioned earlier (gender, age, expected educational level, net income per person, deprivation index). Expected educational level was, in this case, used as a dichotomous variable, with one meaning those with at least 12 years of education (having taken a school leaving exam) and zero meaning those who have fewer than 12 years of education. Gender ($\beta = -0.26$; $p < 0.001$), age ($\beta = 0.12$; $p = 0.005$), and net income per person ($\beta = -0.13$; $p = 0.004$) proved to be significant predictor variables. Females and those with a higher net income per person smoke fewer cigarettes a day; however, there is an increase in the number of smoked cigarettes with age. The complete model explains 8.6% of the variance in the intensity of smoking (adjusted $R^2 = 0.086$).

Finally, in a *fourth model*, also aimed at the intensity of smoking, we examined to what extent the sociodemographic variables used in this research influence the probability of heavy smoking among daily smokers. A dichotomous variable was computed on the basis of the number of cigarettes smoked a day: the two possible values were zero (light smoker), the maximum number of cigarettes smoked being 15; and one (heavy smoker), smoking of more than 15 cigarettes a day. A logistic regression analysis was used in this case as well. Our results show that females have less than half the chance of being heavy smokers than males (OR = 0.46; CI_{95} = [0.32–0.65]). The probability of heavy smoking becomes significantly higher only among people with the lowest educational level compared with the highest level (OR = 2.08; CI_{95} = [1.04–4.13]); all the other variables were controlled for. Higher net income per person (OR = 0.99; CI_{95} = [0.98–1.00]) and higher deprivation index (OR = 0.95; CI_{95} = [0.90–1.00]) slightly decrease, and higher age slightly increases (OR = 1.02; CI_{95} = [1.00–1.03]), the probability of heavy smoking.

Discussion

The primary aim of our study was to report on prevalence of smoking from the results of the NSAPH, and also to compare these results with the results of previous studies. Further, we examined how different social and demographic features influence the prevalence of smok-

ing. Our results support the higher prevalence rates among the heterogeneous results of previous years, while suggesting a slight increase of smoking at the same time. This tendency is unequivocally owing to the increase of smoking among women, whereas in the case of men stagnating prevalence rates can be observed. International studies also draw our attention to the increasing prevalence of smoking among women [28].

In accordance with previous studies, our analyses pointed out that the odds of regular smoking are higher among males, in the younger age group [28, 29], among persons with a lower educational level [29, 30], and among people with a lower net income per person [29]. In a similar way, higher deprivation index and a smoker parent increase the odds of regular smoking [31].

Revealing the major factors in the prevalence of smoking habits is of great practical relevance. The more accurate our knowledge becomes about these risk factors, the more appropriate prevention measures can be developed. It has become evident that prevention should pay special attention to the risk groups of people with a lower educational level or with less favourable socioeconomic status. Prevalence data show an increasing tendency in female smokers, thus drawing our attention to this issue. In connection with the latter, the most recent studies indicate a higher prevalence of smoking among adolescent females in a national representative sample [32] as well as in a local representative sample [33]. Some 60% of countries taking part in ESPAD research experience the disappearance of gender differences or a higher prevalence among adolescent females, too [34], which indicates a further strengthening of this trend in the years to come. International data are also available concerning this issue, so it can be concluded that although in some wealthier countries (e.g. Australia, Canada, United Kingdom and the United States of America) there is a decrease in female smoking, whereas the prevalence of smoking among women in Southern, Central, and Eastern Europe is either stable or shows a tendency to increase, in accordance with our finding [9].

Our results, as well as the fact that in Hungary smoking-related morbidity is twice as high (2.07) as the average in the European Union [35], prove that we must turn our attention to the smoking problem with an even greater intensity than before. It is important to mobilise efficiently both policy decision-makers and doctors, especially in the fields of prevention and smoking cessation. As regards the former, it must be emphasised that providing support for smoking cessation is one of the most cost-effective interventions with regard to the gain in quality adjusted life years [36]. Introduction and support of these evidence-based clinical methods is of crucial importance in Hungary. On the other hand, to achieve these aims, it is especially important to involve doctors, especially family doctors, as their role is crucial in revealing the problem and giving feedback about it, making patients realise the importance of smoking cessation, and referring them to smoking cessation programmes [37].

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