Estimating and managing the changing methodological parameters of self-report surveys of addictive behavior – based on the waves of the National Survey on Addiction Problems in Hungary (NSAPH) in 2007 and 2015

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The standard nature of the procedures and tools of sampling and data collection cannot guarantee the stability of data reliability and validity because non-sampling errors are highly sensitive to social conditions. The present study provides a post-hoc attempt to estimate and manage the changing methodological parameters of self-report surveys of addictive behaviours (being highly subjected to changes in social conditions) to make data interpretation easier. The analysis is based on the data of two national Hungarian representative surveys assessing addiction problems in 2007 and 2015 (National Survey on Addiction Problems in Hungary [NSAPH]). Both surveys were conducted using a Hungarian nationwide representative sample aged 18-64 years applying similar procedures in data collection and -processing. Regarding data concerning substance use, both surveys included variables to estimate non-sampling errors in line with current international practices. The methodological parameters of NSAPH2015 showed an increase in non-sampling errors regarding substance use behaviour compared to NSAPH2007. The present paper elaborates an estimation procedure based on the assumption that when following a population, the proportion of people who have ever engaged in a specific type of addictive behaviour cannot be reduced in the given population over time. This also applies to cohorts followed by cross-sectional surveys among national representative samples, as far as lifetime prevalence and data on the age of first use/activity is available. To identify valid trends in different behaviours in epidemiological research assessing addictive behaviours or other sensitive data, researchers should provide the required conditions for controlling or correcting data by cohort analysis.

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INTRODUCTION

Based on research findings from the past 15 years (Paksi, 2001, 2003, 2009; Elekes & Paksi, 2003; Felvinczi, Paksi, Magi, & Demetrovics, 2015) describing the social attitudes towards different social groups, it can be argued that research targeting addictive problems has been carried out in a moral-social space where attitudes towards marginalized groups are highly negative (see Table 1, Appendix). The unfavourable change in social distance in relation to drug users and most other marginalized social groups makes the analysis of the trends in non-sampling errors over time and the observance of their effect during data interpretation especially important. This is of particular importance in case of such comparative surveys gathering sensitive data such as that collected in the NSAPH.

The present study attempted to (i) estimate the changing methodological parameters of self-report surveys of addictive problems which are highly affected by changes in social conditions, and (ii) support the interpretation of the data by introducing a post-hoc adjustment technique. We attempted to estimate the changes of various addictive problems in Hungary from 2007 to 2015 based on the 2007 and 2015 data of the National Survey on Addiction Problems in Hungary (NSAPH).

The starting point in interpreting changes in different addictive behaviours between 2007 and 2015 in Hungary is that by following a specific population, the lifetime proportion of those who already engaged in a given behaviour cannot be reduced. This finding applies not only to follow-up studies related to individuals, but also to data from cross-sectional surveys made on a representative sample of the population at different times as long as they provided the opportunity to longitudinally follow a cohort of specific age. Therefore, the starting point for the estimation is the fact that, in the case of a birth cohort, the value of lifetime prevalence cannot be reduced over time.

One of the most fundamental questions in relation to self-report surveys concerns the reliability and validity of self-declared answers. Several factors that are not under the control of researchers can influence non-sampling errors. One of these factors is the societal and cultural context of the targeted phenomenon (e.g. Groves, 1989; Johnson, O'Rourke, Burris, & Owens, 2002; Pillók, 2010; Rudas, 1998; Stoop, 2004). This enhances the importance of the questions of reliability and validity, especially in case of self-report surveys targeting the prevalence of hidden and morally judged behaviours such as those related to addictions (Elekes, 2002; European Monitoring Centre for Drugs and Drug Addiction [EMCDDA], 1999a, 2000; Harrison, 1997; Hartnoll, 1993; Hibell, Andersson, Balakireva et al., 2000; Johnston, O'Malley, Bachman, & Schulenberg, 2007a, 2007b; Nyírády, 2009; Paksi, 2007).

Non-sampling errors cannot be eliminated completely and the degree of these biases cannot be quantified. However, instead of providing a reliable absolute degree of the problem in self-report surveys, researchers simply assess changes and trends over time and across geolocations, as well as demonstrating the methodological tendencies and continuous monitoring of the methodological parameters of the surveys implemented. Because such indicators have no absolute degrees[1], obtained values cannot be contrasted to a standard (normal) value, and an interpretation of the obtained value as being too high or too low is not possible (Paksi, 2007). Therefore, a comparative approach is essential in being able to interpret the results. The results of an epidemiological research can be interpreted by viewing such findings in context and by comparing relevant studies that differ in terms of the exact time of data collection and geolocation of the sample. Consequently, the key element of epidemiological studies is to enable comparisons with other populations and previous research.

In order that the timing and interpretation of the results are as accurate as possible, it is crucial to use the same definitions and methods in different waves of data collection. This ambition can be observed among several countries by applying the European Model Questionnaire (EMQ) provided by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA, 1997, 1999b, 2002) in national self-report surveys (Decorte, Mortelmans, Tieberghien, & De Moor, 2009). However, due to the sensitivity of non-sampling errors related to social conditions and their changes, the standardized nature of the sampling and data collecting tools and procedures do not guarantee the stability of the reliability and

[1] If self-report data of alcohol consumption is compared with the alcohol sales statistics, it is found that – in spite of the assumption that actual consumption is also underestimated by registered consumption (World Health Organization [WHO], 1999) – sales figures are consistently higher than self-report values (Elekes, 2004).

validity of the data. Consequently, it is especially important to continuously administer and analyse methodological parameters that are fit and robust enough to control the quality of data in research that targets the collection of sensitive data (e.g., addictive behaviours). In order to compare results of self-report studies of prevalence estimates over time (i.e. to outline valid and reliable trends), the stability of non-sampling errors over time is necessary. In the present study, the aim was to interpret the trends of different phenomena of addictions in Hungary between 2007 and 2015 on the basis of the 2007 and 2015 data collection of the National Survey on Addiction Problems in Hungary (NSAPH).

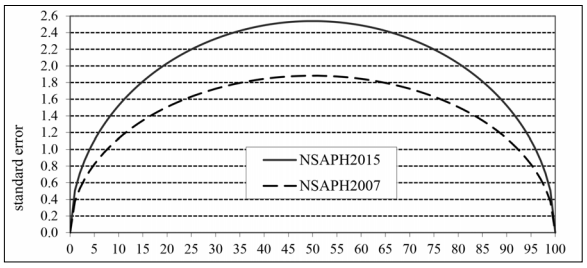
METHODS

Methodological details concerning the 2007 and 2015 datasets

During the data collections of NSAPH2007 and NSAPH2015 we applied state-of-the-art measures supported by research and recommendations from the international scientific community, while we also paid special attention to ensure the conditions of trend analyses. In addition, similar strategies of sampling, data collection, and analyses were used in the different data collection waves to further ensure the comparative nature of the survey data across time (Table 1).

To compare results from different points of time, the level of sampling errors needs to be considered. The margins of error with 95 % confidence intervals were ±1.88 % in 2007, and ±2.54 %[2] in 2015 within the weighted sample of participants aged 18-64 years (see Figure 1).

Figure 1. Theoretical extent of error in the NSAPH surveys of 2007 and 2015 (±percentage points)



Source of previous data: Paksi et al. (2009)

However, applying standard methods and taking the sampling error into consideration are not the only requirements of comparability (e.g., Groves, 1989). It is also essential to maintain the reliability and validity indicators of the data used in the comparison on a specific level to formulate reliable statements concerning trends. Such indicators were in the NSAPH surveys (Paksi et al. 2009, 2017) – in accordance with the international practices (EMCDDA, 1999a, 2000, 2002; European School Survey Project on Alcohol and Other Drugs [ESPAD] Group, 2016; Hibell & Andersson, 1994; Hibell et al. 1997; Hibell, Andersson, Ahlström et al. 2000; Hibell et al., 2004, 2009, 2012; Paksi, 2007) – in relation to the data concerning substance use: rates of inconsistencies of prevalence indicators and age of first use, rates of missing and invalid answers, and the inclusion of a non-existing dummy drug in the survey to predict the risk of overestimating substance use. The analysed indices properly describe the individual data collections. No significant patterns with regards to the socio-economic characteristics of the respondents were observed within the datasets (Paksi et al., 2017). However, when the methodological parameters of the NSAPH surveys of 2007 and 2015 were compared (see Table 2), it can be seen that the majority of indicators in the NSAPH2015 survey trended in an unfavourable direction.

The above trends in non-sampling errors indicate that the analysis of changes requires increased attention in the interpretation of relevant data and may require the use of correction procedures in the estimation or interpretation of trends.

PROCEDURE

When unfavourable changes are detected in the methodological parameters of cross-sectional surveys, estimations about the expected LTP values can be conducted in relation to specific behaviours in the second wave – by keeping the non-sampling errors at the same level – if two cross-sectional surveys conducted at different times are treated as consecutive waves of a cohort study. Requirements of such surveys to be included in the estimation are as follows:

· Inclusion of suitable questions for monitoring non-sampling errors (to calculate inconsistencies and overestimation), methodological parameterization

[2] In calculating the theoretical margin of error, as a so-called conservative solution we started out from a weighted sample of 1490 people. We did not use sample size keeping weighting due to the oversampling used in the 18- to 34-year-old population, the number of individuals actually reached during the research was higher and the corresponding theoretical margin was lower (± 2.055%) than for the weighted sample.

Table 1. Relevant methodological aspects of the NSAPH2007 and 2015[3]

		NSAPH2007[4]	NSAPH2015
Focus of study		Addiction problems	
Geographical coverage		National	
Age		18-64 years	
Sampling strategy		Two-step random sampling stratified by regions, the sizes of settlement and age	
			Overrepresentation of age group 18-34
Gross sample size		3138	2477
Response rate (without supplementary sample)[5]		47.8%	48.7%
Net sample size (N) (with the utilisation of supplementary sample)		2710 (number of individuals reached on the original/main address: 1500)	2274 (number of individuals reached on the original/main address 1206)
Weighting		Weighting that keeps the sample size and matrix weighting by strata	Two-step, weighting that does not keep the sample size, matrix weighting by strata
Weighted sample aged 18-64 years		2710	1490
Data collection procedure		Face-to-face and self-administered technique; Previous request of participation, primary and additional addresses, three trials of contact. Previously prepared interviewers near in age.	
Questions related to drug use		EMQ (EMCDDA, 2002): Lifetime prevalence (LTP), last year prevalence (LYP) and last month prevalence (LMP) by substances, age of first use	
			New psychoactive substances
			(EMCDDA, 2015)
Questions related to alcohol consumption		LYP, LMP, age of first use; binge drinking (6 or more drinks in a single session) LYP, getting drunk LYP, LMP, age of being drunk for the first time	
Questions related to smoking		LTP, regular smoking LTP, age of first smoking, age of the start of regular smoking	
Behavioral addictions	Eating disorders	SCOFF (Morgan, Reid, & Lacey, 1999)	
	Problematic internet use	LTP of internet use	
		PIUQ - Problematic Internet Use Questionnaire (Demetrovics, Szeredi, & Nyikos, 2004; Demetrovics, Szeredi, & Rózsa, 2008)	
	Exercise addiction	LTP	
		EAI-HU– Exercise Addiction Inventory-Hungarian (Terry, Szabó, & Griffiths, 2004; Demetrovics & Kurimay, 2008)	
	Compulsive buying	LTP of shopping for fun	
		QABB– Questionnaire About Buying Behaviour (Lejoyeux, Tassain, Solomon, & Ades, 1997)	CBS– Compulsive Buying Scale (Ridgway, Kukar-Kinney, & Monroe, 2008)
	Problematic gambling	LTP of gambling	
		SOGS– South Oaks Gambling Screen-Hungarian (Gyollai et al., 2011)	PGSI-HU– Problem Gambling Severity Index-Hungarian, (Gyollai et al., 2013); DSM-5– criteria of gambling disorder based on the Diagnostic and Statistical Manual of Mental disorders 5th edition (American Psychiatric Association [APA], 2013)
	Work addiction	WART– Work Addiction Risk Test (Robinson, 1999)	BWAS– Bergen Work Addiction Scale (Andreassen, Griffiths, Hetland, & Pallesen, 2012)

[3] Detailed methodological descriptions of the surveys can be found in the following publications: Paksi, Rózsa, Kun, Arnold, & Demetrovics (2009); Paksi, Demetrovics, Magi & Felvinczi (2017)

[4] NSAPH2007: National Survey on Addiction Problems in Hungary (Paksi et al., 2009)

[5] To compensate for the sample loss, we used a doubled supplementary sample size. The respondents in the supplementary sample were selected according to the same principles (including gender match) as the main sample. The data collection for the supplementary sample was carried out in the same period as the main sample and the data collection technique was also identical with the one applied in the main sample.

Table 2. The reliability and validity indicators of the data about substance use in the NSAPH surveys of 2007 and 2015 (unweighted data)

		2007	2015
Rates of inconsistent responses in the prevalence rates (% of responders)[6]			
Marihuana		0.5	0.5
Ecstasy		0.1	0.7
Amphetamine		0.2	0.4
Tranquilizers without prescription		0.3	0.7
Sedatives without prescription		0.3	1.0
Alcohol consumption		1.7	0.8
Getting drunk		0.8	1.1
Rates of missing and invalid responses (%)			
Illicit drugs /	LTP	5-6	≈10
	LYP and LMP	≈9	≈13
Tranquilizers	LYP	5.4	7.4
without prescription	LMP	4.8	8.8
Sedatives	LYP/	5.1	8.1
without prescription	LMP	4.6	7.6
Alcohol	LYP	3.2	4.7
consumption	LMP	2.1	4.8
Getting drunk	LYP	10.3	7.4
	LMP	10.6	8.8
Smoking (current)		0.3	0.2
Rates of inconsistent responses according to the LTP and age of first use (% of consistent users)[7]			
Marihuana		4.2	5.8
Ecstasy		7.7	10.0
Amphetamine		5.3	31.6
Cocaine		0.0	55.6
Heroin		0.0	250.0
Other opiates		100.0	100.0
LSD		22.2	44.4
Magic mushrooms		40.0	83.3
Inhalants		100.0	250.0
Tranquilizers/Sedatives without prescription		353.3	283.3
Age of first smoking		34.9	47.3
Regular smoking		16.2	36.7
Overestimation: use of the dummy drug			
LTP (N)		6	11
LYP/LMP (N)		2/3	2/2

Source of previous data: Paksi et al. (2009)

of the research, and identifying the appropriate reference dataset (which can serve as a starting point of the estimation and has favourable values of non-sampling errors);
- Inclusion of questions about lifetime prevalence of the behaviour;
- Inclusion of questions about the age of first use/time of engaging in a specific behaviour.

As a first step, we determined the reference database based on the values of non-sampling errors.

During the estimation, we compared the data of those born in the same period at the two study periods (cohort=c). The data of the second study on the age of first use was used to determine the proportion of new entrants (incidence rate=IR) between the two studies ($\sum_{t=1}^{n} IRc$), where t = time, t = 0 is the year of the initial reference survey and n is the number of years between the first reference survey and the second survey year). This ratio was used to adjust the lifetime prevalence rates measured at the time of the second survey ($LTPc_n$) in the comparative cohort. By doing so, we can get the corrected lifetime prevalence rate for the cohort in the second survey ($CLTPc_n$)

$$CLTPc_n = \left(1 - \sum_{t=1}^{n} IRc\right) LTPc_n$$

If in the second measurement the cohort population's lifetime prevalence rate corrected by the new entrants ($CLTPc_n$) is lower beyond the margin of error than the measured lifetime prevalence rate in the first survey regarding the comparative age group ($LTPc_0$) and the first period can be considered as a reference database, then the underestimation rate (URc) can be calculated as follows. For this purpose, the equation below was created.

$$URc = 1 - \frac{CLTPc_n}{LTPc_0}$$

If the non-sampling errors do not show any significant pattern in the studied population, the underestimation rate obtained in the comparative cohort can be extended to the entire study population:

$$CLTP_n = \frac{LTP_n}{1 - URc}$$

[6] In this case, it was considered inconsistent if there was inconsistency in the abstinence rates for different periods (lifetime, one-year, and one-month), and if the frequency of consumption for a shorter period (usually the previous month) exceeded the consumption rates indicated for longer periods (usually lifetime).

[7] The survey contained questions on lifetime prevalence for the majority of drug use and then on the first consumption. On the basis of the correspondence between the answers to these questions, the ratios of consistent consumers or non-consumers, as well as inconsistent respondents were calculated. Respondents who clearly stated in both questions that they had never consumed the given substance were considered to be consistent non-consumers. Those who indicated that they had consumed a specific substance in their lifetime, and gave the year of first use, or indicated a "do not know" response option, were considered to be consistent consumers. Inconsistent respondents included those respondents who clearly indicated consumption of drugs in one of the questions and non-consumption in the other.

RESULTS

The starting point of our analysis of changes in Hungary between 2007 and 2015, as explained above, is the fact that, in the case of a birth cohort, lifetime prevalence cannot decline. Following this logic, the national representative surveys of 2007 and 2015 are treated as consecutive waves of a cohort study. The present study compared the data of those who were born during the same period at the two survey dates. In the present case, the population that can be covered by the two surveys consists of participants born between 1951 and 1989. Therefore, considering the data of participants at the age of 18-56 years in the NSAPH2007 and at the age of 26-64 years in the NSAPH2015 as consecutive waves of a cohort study, the minimum expected lifetime prevalence values of behaviours in focus for 2015 can be estimated keeping the level of non-sampling errors.

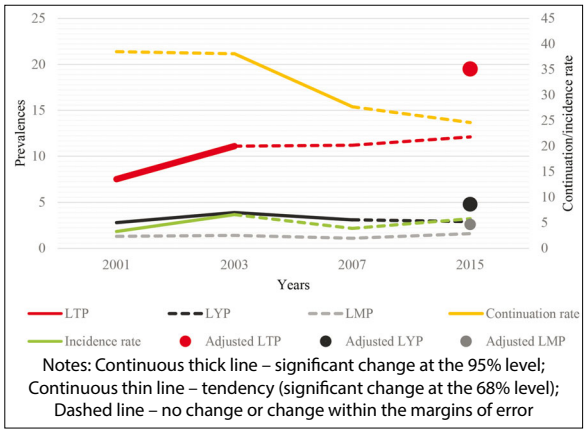
The lifetime prevalence of illicit drug use in the 18- to 56-year age group was 10.9 % in 2007, which – keeping non-sampling errors at the same level as in the previous research, and assuming no new trial in the age group during the eight years between the two surveys – at the same time, represents the minimum lifetime prevalence of drug consumption in 2015 in the 26- to 64-year age group. However, in the 2015 survey, the measured lifetime prevalence rate was 8.3 % in the 26 to 64-year age group and 18.3 % of users tried any illicit drugs for the first time in the past eight years, so the continuation rate for the past eight years was 81.7 %. Based on this, in the 2015 study, the proportion of those who have consumed any illicit drugs earlier, eight years before is only 6.8 %. Thus, following the cohort born between 1951 and 1989, in contrast with the 10.9 % prevalence value in 2007, a measured value of 6.8 % could be set in 2015, meaning a 38 % underestimation. Consequently, the 2015 value measured indicates only 62 % of the proportion of consumers calculated from the value in 2007. As the indices used in presenting the non-sampling errors of the research (see Table 2) did not show any significant patterns of socio-economic characteristics (Paksi et al., 2017) the present authors believe that the cohort-related findings can be extrapolated for the entire population. Adjusting the measured value of 9.9 % with the underestimation ratio found in the cohort, the lifetime prevalence in the 18- to 64-year age group is estimated to be about 16 % (see Table 3).

The adjusted values of prevalence of different periods can be calculated based on 16 % adjusted LTP value, and the rates of continuation and incidence – by keeping the errors at the same level as it was in previous research, shown in Table 4.

If the trends are examined between 2001 and 2015 – taking into account the confidence intervals of each measurement – it can be observed that based on the measured values, after the significant increase in drug use in the 18- to 53-year-old[8] adult population in Hungary between 2001 and 2003, a stagnation can be identified since 2003. However, adjusted values suggest an increase beyond the margin of error over the past eight years (Figure 2).

For the estimation and post-hoc treatment of non-sampling errors, it is required to assess the age of first use in addition to the LTP value to implement the above mentioned procedure. Among the examined substance use behaviours in the NSAPH2007 and 2015 data regarding smoking meet this requirement (Table 1)[11] as well as data about illicit drug use.

Figure 2. Trends in illicit drug consumption between 2001 and 2015 in the 18-53 year old population (%)[9]



Notes: Continuous thick line – significant change at the 95% level; Continuous thin line – tendency (significant change at the 68% level); Dashed line – no change or change within the margins of error

Sources of previous data: Elekes & Paksi (2003); Paksi (2009[10])

[8] The survey of 2003 covered the 18- to 53-year-old population, so long-term comparisons can be made in relation to this age group.

[9] In 2015, the adjusted LTP for the 18- 53-year-old population is 19.5%. 24.6% used illicit drugs in the past 12 month and 13.2% used in the past 30 days of those who have ever used. Based on this, the adjusted LYP is 4.8% and the adjusted LMP is 2.6% (measured values: LYP 2.9%, LMP 1.6%).

[10] It should be noted that data measured between 2001 and 2003 also showed an increase in comparable cohorts, exceeding the value estimated from the previous wave. In 2003 and 2007, LTP values measured for comparable cohorts (18-53 years vs. 22-57 years) were within the margin of error (11.1% in 2003, 9% in 2007, standard error ± 1.3, and ± 1.2), so there was no need to conduct an adjustment procedure in case of previous waves.

[11] Since the LTP values of drinking behaviors (alcohol consumption, getting drunk) were not administered in the survey of 2015, the presented procedure cannot be conducted on them. At the same time, it should be noted that the trends shown by the methodological parameters of data related to alcohol consumption are somewhat ambiguous, and in this case, maintaining the level of non-sampling errors on the same level as they were in previous research was more prevalent.

Subsequently and following adherence to the requirements, the 'audit' and aforementioned adjustment was performed on the basis of the information about the age of first smoking and the LTP of regular smoking (Table 5). The necessity of the procedure is supported by the increased inconsistencies observed in smoking data (Table 2) as well as by the adjusted values of incidence measured in comparable cohorts. Based on the cohort analysis, different trends can be identified with regards to prevalence values of smoking and regular smoking in the population aged 18-64 years. Here, a significant decrease was found – exceeding the margin of errors – in measured LTP values, while the assumed LTP values – if the errors are kept at the same level as they were in previous research – indicate stagnation.

Control questions to monitor the reliability and validity of data usually fall outside of the scope of epidemiological research examining behavioural addictions, so there were no such questions included in the NSAPH surveys. Due to this practice, monitoring the non-sampling errors using adjusted LTP values by cohort analysis can be particularly important in epidemiological studies.

Among the behavioural addictions investigated by the NSAPH surveys in 2007 and 2015, the LTP values of gambling disorder, problematic internet use, exercise addiction and compulsive buying behaviour were measured. Subsequently, the related change in non-sampling errors in relation to these behaviours were calculated[14]. More specifically, in case of gambling and shopping for entertainment, the measured LTP values in 2015 were lower – far beyond the margins of error – than the values in the comparable cohort measured in 2007 (see Table 6, bold), indicating an increase in the underestimation or a decrease in overestimation for these behaviours. As there were no control questions allowing the quality of the data to be estimated in these surveys, the adjustment procedure to calculate changes cannot be conducted,

Table 3. Lifetime prevalence of illicit drug use in 2015 adjusted by cohort-analysis (%)

	2007	**2015**
Studied cohort	age 18-56 years	age 26-64 years
N	2132	1150
Measured LTP	10.9%	8.3%
Incidence rate in the past 8 years (% of LTP_n) ($\sum_{i=1}^{n} IRc$)	-	18.3%
LTP corrected by incidence rate ($CLTPc_n$)	-	0.817*8.3=6.8%
Standard error (with 95% confidence interval)	±1.3	±1.5
Underestimation ratio (UR)	-	1-(6.8/10.9)=0.38
Age group	18-64 years	18-64 years
Valid N	2527	1341
Measured LTP	9.3%	9.9%
Standard error	±1.13	±1.6
Adjusted LTP by cohort analysis ($CLTP_n$)	-	9.9/0.62=16%
Standard error	-	±1.96

Source of previous data: Paksi et al. (2009)

Table 4. Main epidemiological indicators of the illicit drug consumption in the NSAPH surveys of 2007 and 2015 (aged 18-64 years, 95% confidence interval of standard error, %)

Main indicators	**2007**			**2015**			
	N	%	standard error	N	measured %	standard error	adjusted %
LTP	2527	9.3	±1.1	1341	9.9	±1.6	16.0
Continuation rate[12]	219	30.1	±6.1	129	24.0	±7.4	-
LYP	2512	2.6	±0.6	1338	2.3	±0.8	3.8
Current continuation rate[13]	219	14.6	±4.7	129	12.6	±5.7	-
LMP	2514	1.3	±0.4	1343	1.2	±0.6	2.0

Source of previous data: Paksi (2009)

[12] Proportion of those who used last year among those who have ever used.
[13] Proportion of those who used last month among those who have ever used.
[14] Among the behavioral addictions investigated in case of eating disorders and work addictions the LTP values are not available based on the screening questions, therefore the of minimum expected prevalence by cohort analysis cannot be estimated.

Table 5. LTP rates of smoking in 2015 adjusted by cohort analysis (%)

	2007		2015	
Examined indicator	Smoking	Regular smoking	Smoking	Regular smoking
Cohort	Age 18-56 years	Age 26-64 years		
Valid N	2240	2200	1273	1273
Measured lifetime prevalence	55.9	45.3	50.7	40.4
Incidence rate in the last 8 years (% of LTP)	-	-	1.2	2.2
LTP corrected by incidence rate	-	-	50.0	39.5
Standard error (with 95% confidence interval)	±2.1	±2.1	±2.7	±2.7
Underestimation	-	-	1-(50.0/55.9) =10.6	1-(39.5/45.3) =12.8
Age group	Age 18-64 years	Age 18-64 years		
Valid N	2657	2615	1486	1486
Measured LTP	54.7	44.5	49.7	39.1
Standard error	±1.9	±1.9	±2.5	±2.5
Adjusted LTP by cohort analysis	-	-	49.7/0.894=55.6	39.1/0.872=44.8
Standard error	-	-	±2.5	±2.5

Source: Tombor et al. (2010)

because there are no baseline data. Because of the lack of information about the age of first use/time of specific activities, the analysis could only estimate the minimum expected value[15] by the methodological parameterization of the data from each wave.

For the other two behaviours examined, the measured values in the cohort followed are within the margin of error or increase beyond the margin of error (see Table 6). Given that we do not know the age of first use/time of specific activity of the examined behavioural addictions, it can only be said that the methodological stability of the data existed at a maximum rate of 6.5 %[16] of incidence within the population in case of exercise addiction. In case of internet use, the 'accepted rate of incidence' is much higher: 21.6 %.

Table 6. Measured LTP values of the assessed behavioural addictions in the NSAPH surveys of 2007 and 2015 (%)

		2007	2015
Cohort		age 18-56	age 26-64
Gambling (Source of previous data: Gyollai et al, 2011; Kun, Balázs, Arnold, Paksi, & Demetrovics, 2012)	N	2283	1269
	LTP	**65.7**	**59.9**
	Std. error	1.9	2.7
Internet use (other than work-related) (Source of previous data: Koronczai et al, 2011)	N	2280	1275
	LTP	53.8	70.9
	Std. error	2.0	2.5
Exercise (Source of previous data: Mónok et al, 2012)	N	2277	1272
	LTP	39.2	41.0
	Std. error	2.0	2.7
Shopping for entertainment (Source of previous data: Maráz et al, 2015)	N	2277	1270
	LTP	**49.8**	**36.2**
	Std. error	2.1	2.6

Source of previous data: Paksi et al. (2009)

DISCUSSION

The methodological parameters of NSAPH2015 indicated an increase in non-sampling errors in connection with substance use compared to the NSAPH2007. Requirements of the adjustment were met for illicit drug use and smoking. In both cases, the cohort analysis confirmed the underestimation indicated by the errors and it was necessary to adjust the measured values.

Comparing the trends measured in the adult population and that of adjusted values based on cohort analysis, to the findings of the Hungarian ESPAD study (Elekes, Nyírády, 2012; Elekes, 2016), it can be seen that the trends outlined in the ESPAD study confirm the trends presented on the basis of cohort analysis. After 2007, the 16-year-old population, most at risk of exposure to drugs, experienced a significant increase in lifetime prevalence rates (see Appendix Figure 2), which was reflected in the lifetime prevalence values of the adult population aged 18-64

[15] The minimum expected value is the LTPn value assuming no new entrants between the two data collection waves.
[16] The 'accepted rate of incidence' were calculated as follows: (LTP of the second wave + error) – (LTP of the first wave – margins of error)

years between 2009 and 2013.[17] Trends in HBSC studies (Arnold, 2016; Németh & Költő, 2011; see Appendix Figure 3), which harmonize with ESPAD studies, also support the validity of the adjusted adult population data.

In relation to the behavioural addictions investigated, the surveys did not include questions related to the estimation of non-sampling errors. Consequently, there was no opportunity to calculate the methodological parameters for behavioural addictions. The present study measured the LTP values of gambling, internet use, exercise, and shopping for entertainment with screening tools related to problematic gambling, problematic internet use, exercise addiction, and compulsive buying, therefore in these cases it was possible to provide a partial estimation of changes in non-sampling errors with the help of the cohort analysis. In two (problematic gambling, compulsive buying) of the four behaviours investigated, changes in LTP values greater than the margins of error were identified within the cohort in focus, which would justify carrying out more detailed analyses. However, given that the reference database cannot be identified in the absence of control questions and the age of first use/first appearance of the specific behaviour is unknown, the only recommendation that can be made is to create the required conditions instead of further analysis.

One further limitation of the study was the assumption of a stable population and that the population affected by migration or mortality would not significantly differ in its drug consumption habits from the non-affected population[18]. Another possible limitation relates to the response rate. In both years of data collection, the attainment rate was close to 50 %. The sample loss was compensated by a supplementary sample chosen according to the same principles as the baseline sample.

In the long run, besides the inclusion of variables that allow the estimation of non-sampling errors, researchers should naturally work on the development and implementation of methodologies for self-reported addiction studies that are subject to changes in social conditions that are less sensitive to social contexts, thus ensuring the stability of non-sampling errors. Such an opportunity might be the adaptation of the so-called Randomized Response Method (RRM) (Fox & Tracy, 1987; Rudas, 1979; Warner, 1965) to sufficiently ensure the anonymity of the participants. When using a randomized response procedure, the sensitive question is used in conjunction with a neutral alternative, and only the respondents know which question they responded to based on a random experiment with a previously unknown outcome (e.g., by rolling a dice). With this procedure, responses to sensitive questions cannot be identified at the individual level. However, based on the outcome of the random experiment and the population distribution of the neutral question, the distribution of responses to the sensitive question can be estimated at an aggregate level.

Hungarian studies implementing the RRM technique indicate that the procedure is able to significantly moderate biases stemming from mistrust, conformity, and stress related to self-representation (Bornemisza, & Csepeli, 1998; Pillók, 2010). Umesh and Peterson (1991), based on their comprehensive review of RRM techniques, concluded that this procedure can be a useful tool in research when collecting sensitive information from respondents. More recently, Kirtadze et al. (2018) reported promising results concerning the application of this method in the field of addictive problems.

CONCLUSIONS

Based on the analysis in the present study, it is argued that the adjustment of data by cohort analysis would be required. Consequently, it is necessary to create appropriate conditions for the adjustment in order to identify the valid tendencies of different behaviours in epidemiological addiction research and other studies involved in the collection of sensitive data. The number of cases which can legitimately be included in a cohort analysis is decreasing as the time span between the different data collections might increase. The data interpretation and adjustment procedure based on cohort analysis described in the present study can only be used to estimate the data quality problems in the course of estimating short-term changes and only if a reference database is identified.

[17] The decline in the lifetime prevalence rates of the 16-year age group, between 2011 and 2015 can only appear as a decrease in the 18-64 population's LTP if the prevalence rate of the incoming 18-year-olds falls below that of the outgoing grades. However, given that the LTP age pattern in the 55-64 population is currently 2.7% for illicit drugs, so the 14% lifetime prevalence rate of the 16 years old population when they reach the adulthood (18 years) in 2015, should result in an increase in LTP for the 18-64-year-old population.

[18] According to the SEEMIG (Managing Migration in South East Europe) project the migration rate in Hungary is still one of the lowest in Europe (Gárdos & Gödri, 2014)

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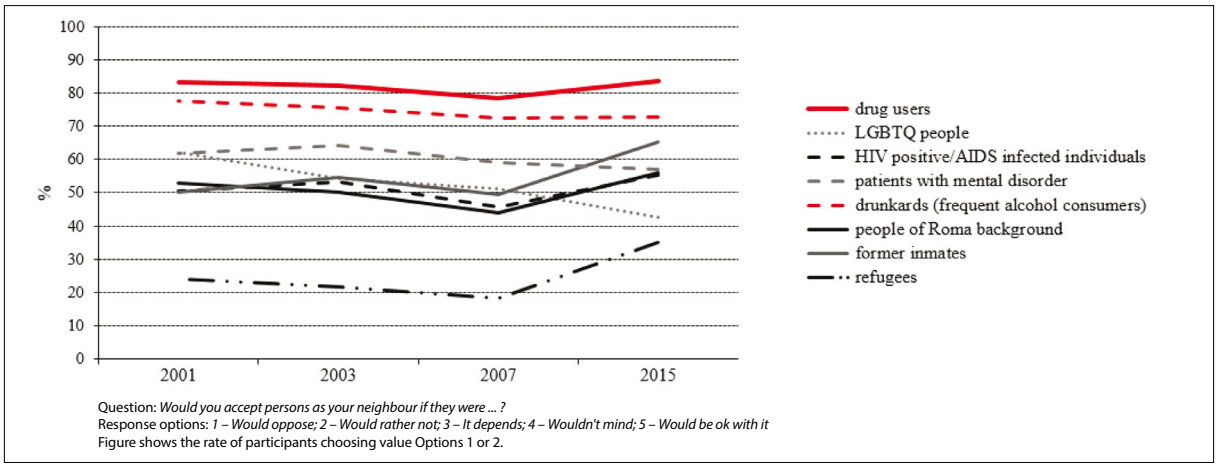
APPENDIX

Figure 1. Trends of social distance in the Hungarian population between ages 18-53 years



Question: *Would you accept persons as your neighbour if they were ... ?*
Response options: *1 – Would oppose; 2 – Would rather not; 3 – It depends; 4 – Wouldn't mind; 5 – Would be ok with it*
Figure shows the rate of participants choosing value Options 1 or 2.

Sources of previous data: Paksi (2009)

Figure 2. Trends in the LTP of illicit drug consumption in the 16-year-old population based on consecutive waves of the ESPAD survey (%)

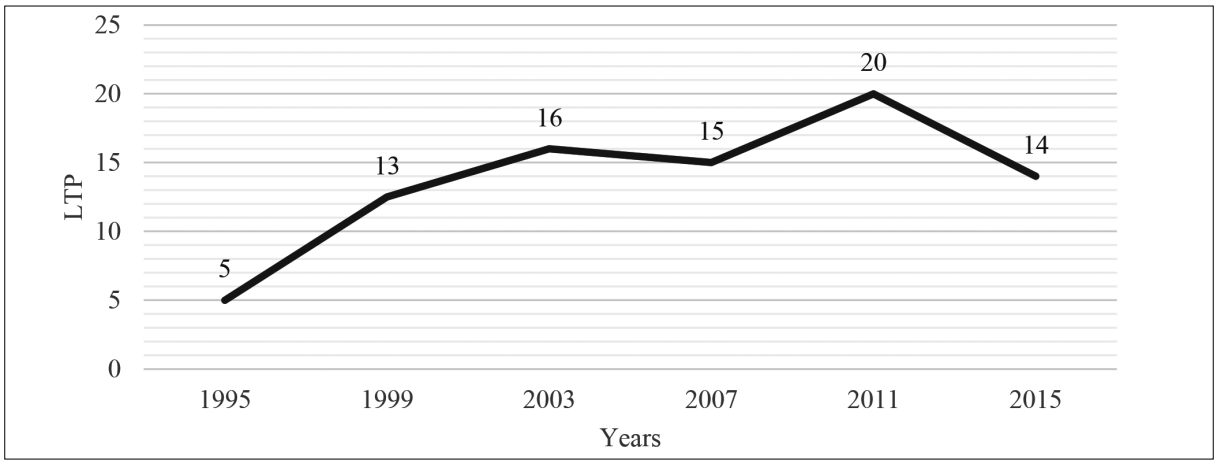
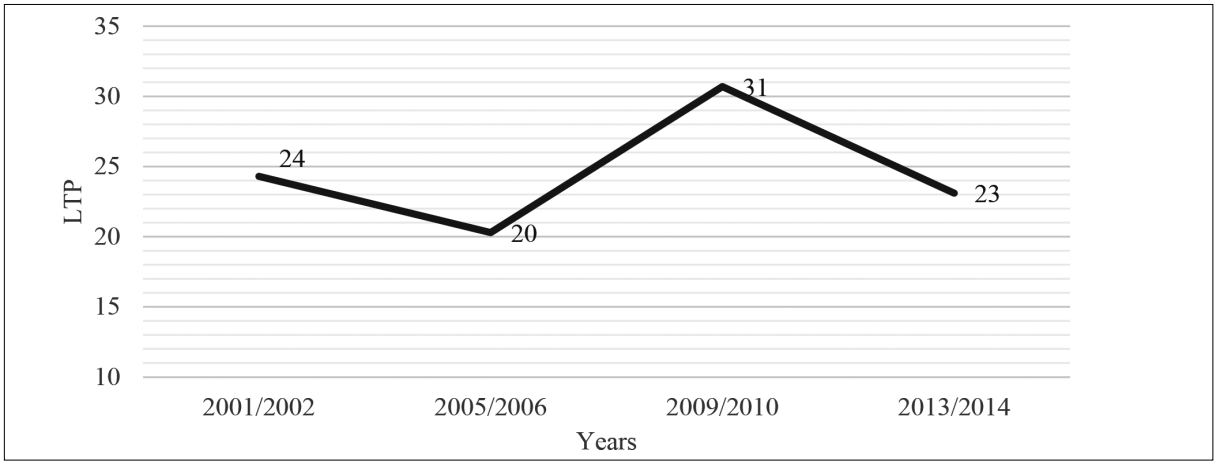


Figure 2. Trends in the LTP of illicit drugs and/or the misuse of legal substances between 2002-2014 among students grade 9-11



Kísérlet az önbevallásos addiktológiai vizsgálatok változó módszertani paramétereinek becslésére és utólagos kezelésére – az Országos Lakossági Adatfelvétel Addiktológiai Problémákról 2007-es és 2015-ös hulláma alapján

Célkitűzések: A mintavételen kívüli hibák társadalmi állapotokra, illetve azok változására való érzékenysége okán a mintavételi, illetve adatfelvételi eszközök és eljárások standarditása nem garantálja az adatok megbízhatóságának és érvényességének stabilitását. A tanulmány a társadalmi körülmények változásának fokozottan kitett önbevallásos addiktológiai vizsgálatok változó módszertani paramétereinek becslésére és az adatok interpretálását segítő utólagos kezelésére tesz kísérletet. **Módszer:** Az elemzés a magyar népesség addiktológiai problémáinak feltérképezésére irányuló országos reprezentatív felmérés (Országos Lakossági Adatfelvétel Addiktológiai Problémákról - OLAAP) 2007-es és 2015-ös hullámának adatain történik. Mindkét vizsgálat a magyarországi 18-64 éves népesség országos reprezentatív mintáján készült, azonos adatgyűjtési és adatfeldolgozási stratégia alkalmazásával. A szerhasználattal kapcsolatos adatok vonatkozásában – a nemzetközi gyakorlatnak megfelelően – mindkét vizsgálat tartalmazott a mintavételen kívüli hibák becslésére lehetőséget adó változókat. A 2015-ös vizsgálat módszertani paraméterei a 2007-es adatfelvételhez képest a szerhasználó magatartások esetében a mintavételen kívüli hibák fokozódását jelezték. **Eredmények/következtetések:** A cikk egy becslési eljárás kidolgozására tesz kísérletet, melynek során abból indul ki, hogy egy populációt követve az idő előrehaladtával az adott populációban nem csökkenhet azok aránya, akik már kipróbáltak valamilyen magatartást. Ez a megállapítás az országos reprezentatív mintán készült keresztmetszeti vizsgálatok által „követett" kohorszokra is érvényes, amennyiben rendelkezésre állnak életprevalenciára, valamint az első használatra/tevékenységre vonatkozó adatok. Elemzéseik alapján a szerzők úgy látják, hogy az addiktológiai – és más érzékeny adatok gyűjtésére irányuló – epidemiológiai kutatásokban a különböző magatartások érvényes tendenciáinak azonosításához szükség lenne az adatok kohorszelemzéssel való kontrolálásához, illetve korrigálásához szükséges feltételek megteremtésére.

Kulcsszavak: addiktológiai problémák; lakossági vizsgálat; reprezentatív felmérés; módszertan; pszichoaktív szerhasználat; viselkedési addikciók