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Social Costs of Gambling in the Czech Republic 2012

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Abstract Evidence about social costs of gambling is scarce and the methodology for their calculation has been a subject to strong criticism. We aimed to estimate social costs of gambling in the Czech Republic 2012. This retrospective, prevalence based cost of illness study builds on the revised methodology of Australian Productivity Commission. Social costs of gambling were estimated by combining epidemiological and economic data. Prevalence data on negative consequences of gambling were taken from existing national epidemiological studies. Economic data were taken from various national and international sources. Consequences of problem and pathological gambling only were taken into account. In 2012, the social costs of gambling in the Czech Republic were estimated to range between 541,619 and 619,608 thousands EUR. While personal and family costs accounted for 63% of all social costs, direct medical costs were estimated to range from 0.25 to 0.28% of all social costs only. This is the first study which estimates social costs of gambling in any of the Central and East European countries. It builds upon the solid evidence about prevalence of gambling related problems in the Czech Republic and satisfactorily reliable economic data. However, there is a number of limitations stemming from assumptions that were made, which suggest that the methodology for the calculation of the social costs of gambling needs further development.

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Background

Gambling is understood as betting on uncertain results, which are to some extent derived from a good fortune. It is a zero sum game: when one player wins, other player(s) must lose (APC 1999). For many people, gambling is a form of entertainment. For others, however, gambling leads to negative consequences to the gambler, to his or her family and even to a wider community. These people are then referred to as a "problem gamblers" (Dickerson 1997; Walker and Barnett 1999) who may develop an addiction disorder, which is recognized by both major diagnostic manuals, ICD (WHO 2010) and DSM (American Psychiatric Association 2013). Pathological gamblers, on the other hand, are gamblers who have already developed a gambling disorder.

Around the world, the prevalence of problem gambling differs. Prevalence in low and middle income countries (LMICs) is largely disregarded, however, a number of studies have been conducted in some high income countries. In Colorado, USA, the prevalence of problem gambling was estimated to be between 1.51 and 3.49% (Volberg 1997); in Queensland, Australia, it was about 1.8% (Schofield et al. 2004); and the prevalence in Western and Northern Europe has been estimated to be between 0.6 and 2.5% (Griffiths et al. 2009). In the Czech Republic (CZ), the prevalence of problem gambling was estimated to be between 1.7 and 2.3% (Mravčík et al. 2014). While Finland and Estonia have prevalence of problem gambling rates around 6%. The prevalence of gambling in CZ is comparable to other European countries, which have prevalence rates between 0.6 and 3.3% (Griffiths et al. 2009).

Costs of gambling studies are quite new in the family of cost of illness studies (Walker 2003; Hayward 2004). Their methodology has been largely derived from the methodology of studies on social costs of alcohol and other drugs which has considerably longer tradition (Single et al. 2001; Collins and Lapsley 2003), and are anchored in classical cost of illness studies (COI). COI differentiate between direct costs addressing health care costs primarily, and indirect costs associated mainly with production losses (McCrone 1998). This approach allows quantifying costs of individual diseases or disorders, which can be then compared with each other. This is valuable for informed decision making in a given area, although reservations are often made because COI studies are not helpful for decisions related to resource allocation (Drummond 1992; McCrone 1998; Byford et al. 2000; Tarricone 2006).

The methodology used to estimate social costs of gambling is currently hindered by lack of consensus in two aspects. First, no attributable fractions similar to those defined for alcohol use disorders (AUDs) have been established for gambling. Second, opinions differ on what to count as a social cost related to gambling (Independent Gambling Authority 2009; Walker and Barnett 1999; Walker 2003). Although substantial methodological progress has been made in association to symposiums held in Whistler, Canada, which aimed to develop guidelines for assessing the social costs of gambling (Smith and Wynne 2000; Wynne and Shaffer 2003), the field is still being contested as no clear guidelines on cost of gambling studies exist. Despite the controversies, it is recommended by the European Union (EU) to conduct cost of gambling studies in order to generate evidence for informed decision making related to gambling policies of individual EU members (EC 2014; Renda et al. 2013).

The aim of this study is to estimate the social costs of gambling in the Czech Republic while utilizing a methodology that reflects the current state of the art and which is anchored in welfare economics.

Methods

Preliminary Considerations

We revised the methodology of the cost of gambling studies conducted by Australian Productivity Commission (APC 1999, 2010), which are considered the landmark studies of the field. Although the APC was criticized from a methodological point of view, the study was both methodologically transparent and so adaptable in a way that enables to incorporate justifiable methodological reservations.

We have adhered to the conservative assumption that social costs might be generated only by problem gamblers (i.e. gamblers in medium and high risk of or suffering from a gambling disorder) as problem gamblers can be considered to behave, at least to a certain degree, irrationally.

In the Australian studies, (APC 1999, 2010) data was primarily collected from the sample of gamblers in treatment, and then extrapolated to the whole group of problem gamblers. This might have introduced a systematic selection bias. First, it can be assumed that gamblers who seek treatment are representative of the more serious cases, which is why they generate higher social costs than other gamblers. On the other hand, it is very likely that social costs are generated by people who were not identified as problem gamblers, and who are representative of the least serious cases. APC assumes that these two contradictory effects offset each other to a large extent, so that the extrapolation of data collected from gamblers in treatment seems like an appropriate approach (APC 1999). In cases where there is not epidemiological data available (as indicated further in the text), we applied the same assumption and extrapolated data from the group of gamblers in treatment to the whole population of pathological gamblers.

Further, problem with identifying cases is associated with the unclear direction of causality. Problem gambling may not be the cause, but rather the result of particular behaviour or disorder (APC 1999). APC has discounted the number of people estimated to be affected by personal and family costs by 20%. This figure may be arbitrary, but in the absence of evidence it is the most transparent approach, thus we have adopted their method in our study.

Definition and Types of Social Costs

Welfare economics claims social costs arise only when some activity leads to society as a whole getting poorer. That is in cases where any individual or group of individuals is losing without anyone else gaining (Varian 2006). Using this approach, we have identified the following groups of social costs related to gambling.

Health and Social Care Costs

The health and social care group of costs is associated with treatment and other services. It includes expenses for hospitals and other facilities providing treatment or assistance to

patients with a gambling addiction (pathological gamblers). These costs also include salaries of staff, overheads and other operational costs. In addition, it might be good to extend this group of costs by opportunity costs (such as the best alternative use of buildings, devices, employees etc.) but such a quantification utilizing micro-costing method would be resource-demanding and exceeding the scope of the current study.

Financial Costs

Gamblers' expenditures related to debts are considered to be transfers, not social costs, because they are balanced by income of lenders. Costs of bankruptcy, however, causes an overall reduction in social welfare as bankruptcy is not offset by income of anyone else. Theoretically, costs related to the debt recovery as well as the costs of execution proceedings could have been included as social costs, but we did not find enough data to quantify these costs reliably.

Costs Associated with Productivity Losses

The gambler's time spent on gambling or on problems associated with his or her gambling could have been dedicated to his or her job and/or to his or her household's work, which constitutes as productivity losses.

Costs of Unemployment

Rates of unemployment as well as frequent job rotation are higher in the group of problem gamblers than in the general population (APC 1999). Leaving employment also generates social costs, such as costs of job search or costs of employee search. APC (1999) stated that there are also costs associated with income loss during a period of searching for a new job. However, from the point of view of welfare economics, lost income during this period does not have an impact to society as the salary of the former employee remains at a given company or it is received by a new employee, so it does not affect the overall welfare of society (Walker and Barnett 1999). Unemployment compensations are considered as transfers and not as costs due to the similar reason; a state fund merely redistributes money and thus does not affect the overall well-being of society? (Walker and Barnett 1999).

Crime and Legal Costs

Financial problems of gamblers may lead to increased criminality. This criminality is usually not linked to violence and brutality, but to theft and robbery (APC 1999). It is difficult to quantify the amount of social costs belonging to this category because the largest component of these costs is probably associated with the costs of crime prevention. In a zero-crime situation, money spent on property protection would be invested in other areas so they could bring greater social benefits. Quantifiable costs include costs of police interventions, judicial proceeding and prison system.

Personal and Family Costs

Personal and family costs belong to the most problematic group of costs from a methodological point of view. Problem gamblers are not able to completely assess

implications of their actions, and this leads to negative social impacts; such as, emotional harm to gamblers and their families, close friends, colleagues and others (APC 1999). Despite the fact that, in APC studies, personal and family costs constitute one of the largest components of the total social costs, unfortunately there is no generally accepted methodology for measuring them. This is because personal and family costs are often considered as intangible by health economists.

In our study, we opted for estimating these costs using unit costs provided by Australian studies which were extrapolated for the Czech Republic. These unit costs include emotional costs for the immediate family, emotional costs for the parents, costs of relationship breakdown, costs of divorce or separation, costs of violence, costs of depression, costs of serious suicidal thoughts and costs of attempted suicide. There are also costs of divorce to children, but we were not able to include these since APC didńt provide any unit cost in this regard.

We have also included costs of depression into the category of personal and family costs. Although, it might seem that costs of depression are the treatment cost, we have taken into account social costs of depression which are mostly associated with non-health care costs.

Costs of Suicides

Costs of completed suicides committed as a direct consequence of gambling are discussed but not quantified within APC studies. We have, however, attempted to estimate these costs as we believe to have sufficient data which allowed us to do so. The costs of completed suicide are resulting from the negative psychological impact caused by gambling, but their consequences are also physical in nature. This is why costs of suicides constitute specific group of social costs, other than personal and family costs. In contrast to personal and family costs, we calculated only costs which are attributable to the gambler. Therefore, we can expect that the total costs of suicides would be higher due to costs being caused to family and parents.

Epidemiological Data

Epidemiological data used in the present study were primarily taken from the recent epidemiological study conducted and published by The Czech National Monitoring Centre for Drugs and Addiction, which is a National Focal Point cooperating with the European Monitoring Centre for Drugs and Drug Addiction (Mravčík et al. 2014). This population survey entitled *National Substance Abuse Research* was based on a representative sample of non-institutionalized Czech population between 15 and 64 years and conducted in 2012. Final sample consisted of 2134 interviewees who underwent face to face, pen-and-paper interviews. According to this study, there were between 123,000 and 170,000 problem gamblers, including 40,000–80,000 pathological gamblers, in the Czech Republic in 2012 (Mravčík et al. 2014). These were the baseline estimates we worked with in our analyses. The study of Mravčík et al. (2014) also provided data on a number of people who were judicially ordered to avoid gambling ($N = 20$) and number of people who were ordered community works because of their problematic behavior related to gambling ($N = 29$).

Additional data were taken from the study Pathological Gamblers in Treatment (NMC 2014), which was based on 229 interviews with gamblers in different Czech medical facilities. These data included a rate of bankruptcy among pathological gamblers (11.4%); a number of employed gamblers who were affected by reduced work productivity (29.9%); a number of working pathological gamblers (64.4%); a number of pathological gamblers

working in household and affected by reduced work productivity (0.4%); an unemployment rate among pathological gamblers (higher than in general population for about 8.3 percentage points); a number of pathological gamblers who changed their job due to gambling (10.4%); a number of people who were in prison due to pathological gambling (15.8%); a number of pathological gamblers who reported that gambling was affecting they immediate family including parents (48.2%) and a number of pathological gamblers with aggressive behavior (13.2%).

We have, however, used further sources to obtain relevant epidemiological data. This included Prison Service of Czech Republic (PSCR 2013) which provided data on a total number of convicted people (N = 12,607) and a total number of prisoners (N = 20,429) in the Czech Republic; the Czech Statistical Office (Škrabal 2013; CSO 2012, 2014) which provided data on a total number of individuals in Czech households (N = 2.3), a total number of residents of the Czech Republic who were older than 18 years (N = 8644 thousand) and a number of court cases in 2012 (N = 96,497); additionally the Institute of Health Information and Statistics provided us with register-based data that enabled us to calculate the total amount of suicides associated with a discharge from inpatient psychiatric treatment for gambling disorders in 2012.

We have also collected additional data from a convenient sample of 57 gamblers in some form of treatment, including self-help group of Anonymous Gamblers (PCP 2014). Data collection took place in August 2014, participants (55 males; mean age 36.1, range 22–58, SD 9.4) were selected via purposive sampling, the only criteria for inclusion were being in treatment for problem or pathological gambling and willingness to participate in the survey. The following data was collected in seven treatment institutions: data related to the amount of decreased work performance (7.0–12.0%); a number of gamblers in contact with police because of minor offenses (6.2%) and because of major offences (11.7%); data on gamblers who have had experienced a relationship breakdown because of gambling in the last 12 months (21.8%); and total number of gamblers who experienced divorce due to gambling in the last 12 months (5.3%).

Additionally, we have asked professionals working in six different health care services for gamblers, for their estimates of a number of gamblers in treatment who suffered clinically significant depression (13.3–23.3%); number of patients who seriously considered suicide (11.1–15.6%); and estimates of suicide attempts among patients (8.7%).

Economic Data

A number of different sources were utilized to obtain reliable economic data. AHIC (2013) gave information on the market share of the Czech's largest insurance company VZP (60%). Three recruitment agencies operating in the country provided us with the average cost of finding a job (842 EUR). The study of the Czech National Monitoring Centre for Drugs and Addiction (Mravčík et al. 2014) provided us with data on average debt of gamblers (35,557 EUR). Act '*č. 549/1991 Sb. o soudních poplatcích* [n. 549/1991 CL. on Court Fees] provided us with the information on court fees related to bankruptcy (5% of the total debt).

Zábranský (2001) estimated that expenses of Police of the Czech Republic on minor and major offences equalled to 86.06% of the total Police budget, and that the expenses of Czech justice system related to criminal law equalled to 26.1% of its total budget. These are the shares of police and justice expenses which may be related to gambling. Zábranský et al. (2011) also estimated that 46.7% of policeman were dealing with minor offences and the remaining 53.3% were dealing with major offences, which is important information about the distribution of police costs related to gambling. A draft of the final state budget of

the Czech Republic in 2012 (PCD 2013) informed the costs of both, the Police of the Czech Republic (1,082,237 thousand EUR) and the Czech justice system (370,696 thousand EUR). Prison Service of the Czech Republic (PSCR 2013) provided data on the average daily costs per prisoner in 2012 (36.4 EUR).

Data on costs of depression (1934 EUR per patient and year) were taken from the study: *Cost of Disorders of the Brain in the Czech* Republic (Ehler et al. 2013). Kennelly (2007) provided data allowing for estimations of costs of suicide of women and men (1,435,671 EUR and 1,642,605 EUR respectively). Kennelly (2007) stated that the social costs related to the suicide of women are slightly lower than social costs of suicide of men because they in average women spend less time doing market activities than men.

The Czech Statistical Office (CSO 2013a, b, c) provided data about average income per year (11,980 EUR), average annual salary in Czech Republic 2012 (11,993 EUR). The World Bank (The World Bank 2013, 2015) provided data about per capita GDP recalculated according to PPP (per capita GDP in the Czech Republic in 1999 reached 58% of per capita GDP in Australia) and data about Australia GDP in 1999 in current US dollar (388,692,192,004). Czech National Bank (CNB 2014) provided data about exchange rate of Australian dollar to Czech Crown in 1999 (1/22.331). Web portal kurzy.cz (2015) provided average exchange rate of Euro to Czech Crown in 2012 (1/25,143). XE (2015) provided data about exchange rate of Australian dollar to the USD in 2015.

The formulas and calculations of individual cost items are presented in the Table 1.

Results

Costs of Treatment and Other Services

The expenses of VZP to all its patients diagnosed with pathological gambling equal 905 thousand EUR in 2012. VZP insures approximately 60% of the Czech population (AHIC 2013) and there were 983 patients with gambling disorder insured by this company in 2012. The treatment of one gambler, therefore, cost approximately 920.7 EUR. After the extrapolation to all insured gamblers in treatment, total costs of medical treatment equal 1508 thousand EUR in 2012.

Financial Costs

Act *č. 549/1991 Sb. o soudních poplatcích* [n. 549/1991 CL. on Court Fees] sets 5% of the total amount of debt as the administrative court fee for the cases of bankruptcy. The average debt of Czech pathological gamblers equated to 35,557 EUR (Mravčík et al. 2014). The average court fee for the cases of gambling-related bankruptcy, therefore, equal 1778 EUR. Bankruptcy as a result of gambling occurred at 11.4% of pathological gamblers who were followed up for 7.1 years (NMC 2014), which after extrapolating to the whole group of problem gamblers corresponds to total of 1975 to 2730 gamblers annually. The total costs of bankruptcy, therefore, ranged between 3512 and 4854 thousand EUR.

Costs of Productivity Losses

The estimated extent of reduced work performance among pathological gamblers ranged between 7.0 and 12.0% according to the NIMH (2014). National epidemiological studies

Table 1 Methodology for costs of gambling estimations

Type of cost	Formula	Calculation
Costs of treatment		
Treatment	Costs of treatment of one gambler × number of gamblers in treatment	920.7 × 1638.3
Financial costs		
Costs of bankruptcy	Number of personal bankruptcy X fees for judicial proceeding	(1975–2730) × 1778
Costs of productivity loss		
Reduced work performance	Reduced work performance × number of gamblers with lower performance × average income per year (in EUR)	(7.009–11.988%) × (23,739–32,810) × 11,980
Reduced housework performance	Reduced performance × number of persons with lower performance × 1/3 of average income per year (in EUR)	(7.009–11.988%) × (492–680) × 1/3 × 11,980
Costs of unemployment		
Employee search	Number of job losses × costs of search for a new employee	(10,209–14,110) × 1199
Job search	Number of job changes × costs of job search ÷ 2	(12,841–17,748) × 842 ÷ 2
Crime and legal costs		
Police interventions	Costs of police interventions × proportion of police interventions related to gambling[a]	(434,951,267 × (0.57–0.79%)) + (496,421,895 × (4.71–6.52%))
Judicial proceeding	Costs of judicial proceeding x proportion of court cases related to gambling	96,751,656 × 2.21%
Prison system	Average daily cost of prison × 365 × number of people imprisoned in relation to gambling	36.4 × 365 × 3228
Personal and family costs		
Burden of family members	Number of affected family members × 0.8[b] × unit costs to family members + number of influenced parents × 0.8[b] × unit costs to parents	25,064 × 0.8 × 3385 + 0
Relationships breakdowns	Number of relationships breakdowns × 0.8 × 2 × cost of relationship breakdown	6600 × 0.8 × 2 × 3385
Divorces	Number of divorces × 0.8[b] × 2 × cost of divorce	2120 × 0.8 × 2 × 10,154
Violence	Number of violent crimes × 0.8[b] × cost of violence crime	5280 × 0.8 × 3385

Table 1 continued

Type of cost	Formula	Calculation
Depression	Number of pathological gamblers with depression × 0.8[b] × cost of depression	(880–3096) × 0.8 × 2033
Suicidal thoughts	Number of pathological gamblers thinking about suicide × 0.8[b] × costs of thoughts about suicide	(960–2744) × 0.8 × 20,308
Suicide attempts to gambler	Number of suicide attempts × 0.8[b] × costs of suicide attempt	3420 × 0.8 × 33,846
Suicide attempts to family	Number of suicide attempts × 0.8[b] × costs of suicide attempt to family	4446 × 0.8 × 20,308
Suicide attempts to parents	Number of suicide attempts × 0.8[b] × costs of suicide attempt to parents	6156 × 0.8 × 3385
Cost of completed suicide		
Completed suicides	(Number of male suicides × 0.8[b] × cost of female suicide) + (number of female suicides × 0.8[b] × cost of male suicide)	(10 × 0.8 × 1435,671) + (50 × 0.8 × 1,642,605)

[a] Calculated separately for minor and major offences and then added together

[b] Coefficient 0.8 was used in formulas to discount the results by 20% where there is an unclear causality

(NMC 2014; Mravčík et al. 2014) suggested that 29.9% of all working pathological gamblers were affected by reduced work productivity. Since 64.6% of pathological gamblers were employed, the reduced work productivity affects 19.3% of pathological gamblers (NMC 2014). This was extrapolated to the whole group of problem gamblers as indicated in the methods section. Average annual income in the Czech Republic 2012 was 11,980 EUR (CSO 2013a). Hence, the total costs of loss of work performance ranged between 19,933 and 47,120 thousand EUR.

The estimated loss of work performance was applied also to the 0.4% of gamblers who were working at home and were affected by the reduced work productivity (NMC 2014; Mravčík et al. 2014). We adhered to the assumption applied in Australian study (APC 1999), which stated that the average annual household productivity is comparable to the one-third of work productivity. Household's productivity in the Czech Republic in 2012 was, therefore, equal to 3993 EUR, and the total costs of reduced housework performance ranged between 138 and 326 thousand EUR.

Costs of Unemployment

According to the Australian study (APC 1999) the total costs of finding a new employee are equal to 10% of his or her annual salary. In the Czech Republic in 2012, the average annual salary was 11,993 EUR (CSO 2013b) which means that the average costs of finding a new employee were estimated to 1199 EUR. Unemployment rate was found to be 8.3% points higher among pathological gamblers than in general population (NMC 2014), which

means that there were between 10,209 and 14,110 problem gamblers looking for a job in the Czech Republic 2012. Total costs of employee search, therefore, ranged between 12,241 and 16,918 thousand EUR.

The total costs of job search were suggested to be equal to one half of costs of job search conducted by a specialized agency. Based on information provided by specialized Czech agencies, the average cost of finding a job in Czech Republic were equal to 842 EUR. This implies that the costs of finding a new job were on average equal to 421 EUR. Mravčík et al. (2014) stated that 10.4% of pathological gamblers changed their job because of gambling. Total costs of job search, therefore, ranged between 5406 and 7472 thousand EUR.

Crime and Legal Costs

Total costs of Czech police equalled 1,082,237 thousands EUR in 2012. These might be divided into two groups; the first group contains costs that might be related to gambling, such as costs of investigation of major and minor offences; the second group contains costs that are clearly unrelated to gambling, such as costs of protection of the Czech president, costs of protection of Constitutional Officials, costs of Office for the Investigation of Communist Crimes and others. The first group of costs accounts for 86.1% of total police costs; out of that 53.3 and 46.7% is dedicated to the major and minor offences respectively.

NIMH (2014) demonstrated that annually 11.7% gamblers in treatment came into contact with police because of major offenses and 6.2% of the gamblers because of minor offences. Therefore, the total number of major offences related to gambling ranged between 14,355 and 19,840 cases, which is 4.7–6.5% from all major offences. Minor offenses associated with gambling ranged between 7662 and 10,590 cases, which is 0.6–0.8% from all minor offences. This means that the total costs of police related to gambling ranged between 25,861 and 35,803 thousand EUR.

The study by Zábranský (2001) found that in the Czech Republic 26.1% of the total costs of the judiciary were spent on criminal law. Total costs to judiciary were derived from the draft of the final budget of the Czech Republic in 2012 (PCD 2013). According to this, total costs to judiciary equalled to 370,696 thousand EUR, and criminal law accounted for 26.1% of all judiciary costs. 15.8% ($n = 3228$) of prisoners were in jail because of crimes related to gambling (NMC 2014). The average daily costs per prisoner in 2012 were 36.4 EUR (PSCR 2013). Thus, total costs to prison system were equal to 42,887 thousand EUR. Further 1992 individuals (PSCR 2013) were convicted because of gambling. Court also ordered avoiding gambling to 20 people and performing community work to 29 persons because of gambling (Mravčík et al. 2014). This means that there were 2041 gambling related criminal cases in 2012, which is 2.1% of all criminal law court cases. The total costs to judiciary connected to gambling were therefore equal to 2051 thousand EUR.

Personal and Family Costs

We have recalculated per capita GDP according to PPP (The World Bank 2013) in order to derive Czech personal and family unit costs out of the APC (1999) study. The resulting numbers were converted into Czech crowns (CNB 2014) and adjusted for inflation (CSO 2014). Resulting unit costs are shown in Table 2.

In line with the Australian studies, all family costs were discounted by 20% in order to adjust for unclear causality (APC 1999). Also, family costs were estimated only for pathological and not for problem gamblers (APC 1999). It was estimated that there were

between 40 and 80 thousand pathological gamblers in the Czech Republic (Mravčík et al. 2014), and we have based our calculations on the lower estimate of a total number of pathological gamblers. In accordance with the methodology of APC, we have used a higher bound of costs shown in the Table 2 when calculating suicide related costs (i.e. thought of suicide and suicide attempts).

Emotional Costs for the Immediate Family and Parents

48.2% of gamblers in the treatment indicated that their gambling is affecting their immediate family and that this includes their parents as well (Mravčík et al. 2014). There are, in average, 2.3 individuals in the Czech households (Škrabal 2013), which is 1.3 other members when a gambler himself or herself is not counted. After extrapolating to all pathological gamblers, total emotional costs for the family were therefore estimated to 67,873 thousand EUR.

Relationship Breakdown

According to NIMH (2014), 21.8% of gamblers have experienced relationship breakdown because of gambling in last 12 months. We adjusted data for divorces (these are considered below) so the final rate of relationship breakdown was 16.5%. Relationship breakdown does not influence only gambler but also his or her partner so the total number was multiplied by two. Total costs of relationship breakdowns were after extrapolating to all pathological gamblers equal to 35,746 thousand EUR.

Divorce

It was also estimated that 5.3% of gamblers have experienced divorce in last 12 months because of gambling. In addition, divorce not only influences the gambler but also his or her partner, so the total number was multiplied by two. Total costs of divorces and

Table 2 Personal and family unit costs in EUR

Type of costs	Lower est.	Higher est.
Emotional costs for the immediate family		
Of pathological gamblers	3385	10,154
Emotional costs for the parents		
Of pathological gamblers	0	3385
Relationship breakdown	3385	10,154
Divorce or separation	10,154	20,308
Violence	3385	10,154
Depression		
Often to always	3385	10,154
Seriously thought of suicide	10,154	20,308
Attempted suicide		
For the gambler	20,308	33,846
For the immediate family	10,154	20,308
For the parents	0	3385

separation were after extrapolation to all pathological gamblers estimated to 34,442 thousand EUR.

Costs of Violence

The survey NMC (2014) demonstrated that 13.2% of gamblers acted aggressively or attacked someone physically. In accordance with the APC, we assumed that victims of violent acts bear the psychological unit cost. Total costs of violence were after extrapolating the number of attacks to all pathological gamblers estimated to 14,298 thousand EUR.

Costs of Depression

We derived costs of depression from the study *Náklady na poruchy mozku v České republice (Costs of brain disorders in the Czech Republic)* (Ehler et al. 2013). These were adjusted for inflation (CSO 2014) which resulted to a total average costs of 2033 EUR per patient with depression. Estimates of expert physicians caring for pathological gamblers suggested that 13.3–23.3% of their patients suffered from clinically significant depression. This number was adjusted for the number of individuals with suicidal thoughts (11.1–15.6%) and then extrapolated to all pathological gamblers. Total costs of depression ranged between 1431 and 5035 thousand EUR.

Costs of Suicidal Thoughts

Estimates of expert physicians caring for pathological gamblers suggested that suicide seriously considered 11.1–15.56% patients with a comorbid depression disorder. In order to avoid possible double-counting, this number was adjusted for 8.7% of pathological gamblers who attempted suicide. Total costs of suicidal ideations, therefore, ranged between 15,597 and 44,580 thousand EUR.

Costs of Suicide Attempts

Estimates of expert physicians suggested that suicide was attempted by 8.7% of all patients treated for gambling disorder. We adjusted this for completed suicides ($N = 60$) in order to avoid double counting and extrapolated data to all pathological gamblers. Resulting costs of suicide attempts were estimated to 92,603 thousand EUR.

Costs of Attempts to Family

The average number of household members, excluding a gambler himself or herself, was multiplied by the lower estimate of a number of affected pathological gamblers, and this resulted into total costs of suicidal attempts to gambler families of 72,232 thousand EUR.

Costs of Attempts to Parents

In accordance with Australian studies (APC 1999) we assumed that the average number of parents of the gambler is 1.8. The total number of affected individuals was determined by

multiplying number of parents with lower estimate of affected pathological gamblers. Total costs of attempts to parents were, therefore, estimated to 16,670 thousand EUR.

Cost of Completed Suicide

Also, in the case of completed suicides the causality is unclear, so we reduced the overall number of committed suicides by 20%. Quantification of these costs was based on a study by Kennelly (2007), and conversion of per capita GDP was calculated according to PPP (The World Bank 2013). The resulting number was adjusted for inflation (CSO 2014), and total costs of one suicide were estimated to 1,435,671 EUR and 1,642,605 EUR for women and for men respectively.

In order to estimate the number of completed suicides attributable to gambling we used a conservative estimate derived from Australian studies (APC 1999), that is the assumption that suicides related to gambling are approximately 5–10 times higher than in the general society (APC 1999). In the Czech Republic 2012, there were approximately 8644 thousand people aged over 18 years (CSO 2012) and the total amount of suicides of adult people was 1630 (IHIS 2014). Taking into account the unclear direction of causality, 30–60 suicides were estimated to be attributable to gambling in 2012. We worked with the higher estimate in our analyses, because Czech registers showed that 7% of those discharged from the gambling related treatment committed suicide within a year after discharge. If we would have extrapolated 7% of suicides to the whole population of pathological gamblers, the actual number of suicides associated with gambling would be approximately five times higher than 60. However, we have decided to work with the conservative estimate and assumed that suicides among pathological gamblers are 10 times higher than among general population which corresponds to 60 suicides in 2012. Gender distribution of men and women corresponded approximately to 82.4% suicides for men and 17.6% for women (Mravčík et al. 2014). This means that there were 50 males and 10 females who were gamblers and committed suicide. Total costs of completed suicides were therefore estimated at 77,190 thousand EUR.

As it is shown in the Table 3, the overall social costs of gambling in the Czech Republic 2012 ranged between 541,619 and 619,608 thousands EUR.

Discussion

Our estimates of the social costs of gambling in the Czech Republic demonstrate a substantial economic burden to society. While the highest costs are associated with personal and family costs, costs related to treatment are relatively low. These results are in line with the Australian study (1999) which estimated the relative expression of the overall social costs to 0.65% of its GDP. In contrast, in the Czech Republic, this ratio was estimated to 0.37% of its 2012 GDP. This is mainly caused by lower personal and family costs, which accounted for 63% of all social costs in the Czech Republic, but 93% of social costs in Australia.

However, the results of this study must be taken with caution as present limitations are mostly methodological in nature and they reflect the current state of art in the field. This is particularly salient in the case of emotional costs which were derived from rather arbitrary estimates of Australian study (APC 1999). Costs of completed suicides to parents or costs of divorce to children were not included at all as we did not have any reliable data to do so.

Table 3 Results for individual cost items and overall costs in thousands of EUR

Type of cost	Lower est.	Higher est.
Costs of treatment		
Treatment	1508	1508
Financial costs		
Costs of bankruptcy	3512	4854
Costs of productivity loss		
Reduced work performance	19,933	47,120
Reduced housework performance	138	326
Costs of unemployment		
Employee search	12,241	16,918
Job search	5406	7472
Crime and legal costs		
Police interventions	25,861	35,803
Judicial proceeding	2051	2051
Prison system	42,887	42,887
Personal and family costs		
Burden of family members	67,873	67,873
Relationships breakdowns	35,746	35,746
Divorces	34,442	34,442
Violence	14,298	14,298
Depression	1431	5035
Suicidal thoughts	15,597	44,580
Suicide attempts to gambler	92,603	92,603
Suicide attempts to family	72,232	72,232
Suicide attempts to parents	16,670	16,670
Cost of completed suicide		
Completed suicides	77,190	77,190
Total €	541,619	619,608

Methodologically robust results for the emotional costs could be achieved, but several costly and lengthy studies would have to be conducted beforehand in order to arrive to reliable estimates. The same is true for attributable fractions which has been established for alcohol but not for gambling.

Other kind of limitations stem from data availability. For instance, data on costs of police were not directly available and their calculation was preceded by a number of assumptions. Quantification of opportunity costs of treatment and other services wasńt included in this study because this would require utilizing micro-costing method and this in turn would be resource-demanding and exceeding the scope of current study. We also have not been able to obtain some reliable data, such as those related to costs of debt recovery and costs of execution proceedings. Furthermore, the representativeness of some of the epidemiological data utilized in this study might be limited. The majority of the epidemiological data consists of data from representative surveys and from national statistical institutions, such as the Czech Statistical Office and the Institute of Health Information and Statistics. However, some epidemiological data—such as those concerning the decrease in work performance, minor and major offences, relationship breakdowns and divorces,

gambling-related depression, gambling-related serious suicidal ideation and suicide attempts—come from surveys which were conducted especially for the purposes of the present study. These additional surveys adopted convenience sampling, which could have potentially lead to bias in our results. We tried to eliminate this bias by carefully selecting the purposeful sample of experts and patients from several treatment institutions throughout the Czech Republic.

In order to better understand possible bias, results of the aforementioned surveys were compared with other relevant studies. Eby et al. (2015) found 13.7% of non-treatment seeking US gamblers to have productivity-related problems at work, which is more than our estimate of decreased work performance (7.0–12.0%). In the present study, the number of gamblers in contact with police because of minor (6.2%) and major offences (11.7%) also seems to be underestimated, because other studies report considerably higher prevalence of criminal behaviour among gamblers (Folino and Abait 2009). The same applies to our estimates of both relationship breakdowns and divorces, which are probably also more prevalent among problem gamblers (Shaw et al. 2007). The number of gamblers in treatment who seriously considered suicide (11.1–15.6%) and those who attempted suicide (8.7%) may also be underestimated. Petry and Kiluk (2002) found 17% of pathological gamblers in Connecticut 1998-2002 to be suicide attempters and further 32% of pathological gamblers to experience suicidal ideation. Additionally, in Singapore, the prevalence of suicide ideation and attempts in the population of gamblers was higher −37.2 and 11.2% respectively - than what was found in our study (Manning et al. 2015). Finally, our estimate of gamblers who experienced clinically significant depression (13.3–23.3%) is in line with the findings of Cowlishaw and Kessler (2015), who identified a 2.6 times higher prevalence of depression among problem gamblers than in the general population.

This study has several strengths. To the best of our knowledge, it is the first study to systematically assess social costs of gambling in the region of Central and Eastern Europe. We have built it on a solid epidemiological evidence and have used a societal perspective, which enabled us to see a wide spectrum of gambling related costs. This is especially useful for the further development of gambling related regulation.

The overall social cost of gambling in the Czech Republic in 2012 were estimated to range between 541,619 and 619,608 thousand EUR and we assume that if no regulatory measures are applied, these costs will escalate due to expansion of gambling on internet and its immediate availability through smart phones, tablets, and other devices. Socio-economic burden of gambling might be decreased by implementing cost-effective prevention measures. Currently, effectiveness of CBT based therapies (Cowlishaw et al. 2012; Gooding and Tarrier 2009; Pallesen et al. 2005) and of motivational interviewing (Yakovenko et al. 2015) is most supported by evidence.

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Compliance with Ethical Standards

Conflict of interest This study was partly founded by the Czech Ministry of Finance and conducted in order to enable informed decision making with regard to the prospective gambling-related legislative changes in

the Czech Republic. Ministry of Finance had no role whatsoever as far as the design of the study, data analyses and data interpretation are concerned. Otherwise, authors declare that they have no conflict of interest.

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