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A monetary valuation of the quality of life loss associated with pathological gambling: an application using a health utility index

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Abstract

This study estimates the Health Related Quality of Life (HRQoL) costs of gambling addiction. Pathological gamblers were recruited from treatment centers in Western Switzerland. The difference in HRQoL between pathological gamblers (n=52) and a sample drawn from the general population (n=93) was measured through a multi-item instrument, the SF-6D. We used a tobit regression to estimate the effect of pathological gambling on HRQoL, controlling for comorbidities and age. Finally, to obtain a monetary value of the HRQoL loss attributable to gambling addiction, we applied an existing value of a life year estimate. Results showed that pathological gambling is significantly associated with a decrease in the quality of life by 0.076 quality adjusted life year (QALY). The resulting cost per pathological gambler and per year was estimated at CHF 3,830. This study suggests that ignoring quality of life costs results in an underestimation of the social burden of gambling addiction.

Résumé

Notre étude avait pour but d'évaluer les coûts de la dépendance au jeu en fonction de la qualité de vie liée à la santé (QVLS). Nous avons recruté des joueurs pathologiques dans des centres de traitement en Suisse occidentale. Nous avons mesuré l'écart de QVLS entre ces joueurs (n=52) et un échantillon issu de la population générale (n=93) au moyen d'un instrument à variables multiples appelé SF-6D. Nous avons eu recours à la régression Tobit pour évaluer l'effet du jeu pathologique sur la QVLS en contrôlant les variables de la comorbidité et de l'âge. Enfin, nous avons attribué une valeur monétaire à la perte de QVLS associée à la dépendance au jeu en nous fondant sur une estimation de la valeur actuelle d'une année de vie (VAV). Les résultats révèlent un lien significatif entre la dépendance au jeu et une diminution de la qualité de vie, soit 0,076 année de vie ajustée en fonction de la qualité (AVAQ). Le coût annuel par joueur pathologique est évalué à 3 830 francs suisses. Il ressort clairement de notre étude que le fait de ne pas tenir compte des coûts liés à la qualité de vie conduit à une sous-estimation du fardeau social de la dépendance au jeu.

Introduction

The cost of gambling addiction to society is a fairly new subject in the health economics literature. Politzer, Morrow, and Leavey (1981, Fall/Winter) were, through a sample of pathological gamblers in treatment, among the first to assess the cost of this specific addiction. More recently, Thompson, Gazel, and Rickman (1996) in Wisconsin, Westphal, Johnson, and Stevens (1999) in Louisiana, Schwer, Thompson, and Nakamuro (2003, February) in Southern Nevada, and Fong, Fong, and Li (2011) in Macao all investigated the social cost of gambling addiction. On a nationwide level, a comprehensive study in the United States focused on the prevalence and social cost of this particular addiction (Gerstein et al., 1999). Generally, two types of cost are estimated: (1) the expenses of treating the consequences of gambling addiction—direct costs—and (2) the productivity lost because of the habits of the pathological gamblers—indirect costs. In fact, little meaningful focus has thus far been placed on the loss of quality of life suffered by the pathological gambler and his or her family.

A notable exception was the report on gambling industries conducted by the Productivity Commission in Australia (1999). The Commission produced the most comprehensive study thus far to explore all aspects of gambling, including the attendant social burden of gambling. It was the first study in which the Health Related Quality of Life (HRQoL) costs were taken into account. It is worth noting that these costs account for more than 90% of the total burden of gambling addiction. Indeed, for gambling addiction (unlike alcohol abuse or smoking) the treatment costs are relatively low. It can be argued that this cost must be considered when estimating this social burden. In fact, a social cost estimate must consider *all* the external consequences created by gambling addiction. It can be argued that the loss of the quality of life of the gambler is a private cost, as it is the result of his or her behaviour alone. This interpretation would however mean that, because the cost is internalized or individual, it should not be included in the social cost estimation. This latter assumption is based on the model of rational addiction suggested by Becker and Murphy (1988), one which assumes that the addict is fully informed of the potential consequences of their actions, and acts as a rational consumer. An alternative view is that the gambler is not fully informed, most notably concerning the potential addictive risks of gambling and the odds of winning, and is probably not completely rational in outlook and behaviour; the loss of quality of life of the gambler should therefore be considered a social cost. In this paper, we support the latter position and thus follow the classical model suggested in the health economics literature (Collins & Lapsley, 2002; Productivity Commission, 1999; Single et al., 2001).

Gambling studies show consistently that pathological gambling is associated with poorer quality of life. Using the Short-Form 12 version 2 (SF-12v2) in a general population survey, Morasco and colleagues (2006a) demonstrated that pathological gambling was significantly associated with a lower quality of life. This conclusion has been corroborated by a number of other studies based on selected samples of pathological gamblers. Indeed, Black, Moyer, and Schlosser (2003) used the Short-Form 36 (SF-36) to assess successfully the quality of life of pathological gamblers. The three researchers determined that this population exhibited lower physical and mental health subscale scores. Using the SF-12v2 in a sample of older adults, Erickson, Molina, Ladd, Pietrzak, and Petry (2005), as well as Pietrzak, Molina, Ladd, Kerins, and Petry (2005), discovered a negative correlation between this disorder and quality of life (see also Scherrer et al., 2005, for similar results).

Two other studies used the SF-12v2 to assess the health related quality of life of pathological gamblers recruited at a dental clinic (Morasco & Petry, 2006), and at an urban primary care clinic (Morasco et al., 2006b), respectively. In both studies, gambling disorders were found to be negatively correlated with scores on the SF-12v2 subscales. Using a self-rated quality of life measure, Fong, Campos, et al. (2011) found a significant lower quality of life for pathological gamblers compared to non-problem gamblers. However, no differences were identified between at-risk, problem, and pathological gamblers. Finally, Lin et al. (2010) concluded that the loss to income ratio was a good measure of the quality of life, and corroborated these previous findings.

Taken together, these results demonstrate unambiguously that this particular disorder is significantly associated with impairment in well-being. To strengthen this association, it is well established that pathological and problem gamblers display high rates of comorbidity (Petry, 2005; Westphal & Johnson, 2007). For example, elevated rates of substance use disorders are commonly observed in this specific population, most notably alcohol abuse, tobacco consumption and drug use (Fong, Campos, et al., 2011; Gerstein et al., 1999; Johansson, Grant, Kim, Odlaug, & Götestam, 2009; Momper, Delva, Grogan-Kaylor, Sanchez, & Volberg, 2010; Petry, 2005; Petry, Stinson, & Grant, 2005; Tidwell, & Parker, 2001; Welte, Barnes, Wieczorek, Westphal & Johnson, 2007). The frequency of mood disorders, particularly depression, is also substantially higher in this population compared to the respective frequencies in non-gamblers and non-problem gamblers (Bland, Newman, Orn, & Stebelsky, 1993; Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; Johansson et al., 2009; Momper et al., 2010; Petry, 2005; Petry et al., 2005; Westphal & Johnson, 2007).

Nevertheless, the causal path linking these disorders to problem gambling remains rather unclear. On the one hand, gambling problems may precede the onset of depression (McCormick, Russo, Ramirez, & Taber, 1984). On the other hand, mood and anxiety disorders have also been found to predate and predict the onset of pathological gambling (e.g., Kessler et al., 2008). However, to estimate accurately the social cost attributable to pathological gambling, it is necessary to know whether the comorbidity precedes the onset of gambling addiction or is a consequence of this addiction. If the comorbid condition appears first and is unrelated to the gambling addiction, its cost should not be included in the estimation of the social burden of gambling addiction. Conversely, if the comorbidity resulted from the gambling addiction, then its cost must be included in this estimation. Given this high comorbidity and the lack of clarity on causal sequence, we attempted, in the present analysis, to identify, characterize and control for the comorbidities to avoid attributing all of the HRQoL loss to gambling addiction. The assumption that none of these comorbid disorders resulted from gambling addiction served to keep HRQoL estimates conservative.

The objective of this study was to find the HRQoL costs of problem and pathological gambling in Switzerland. The first step of this valuation process was to estimate the quality of life of pathological gamblers as compared to that of a control group. For this purpose, we used a preference-weighted HRQoL questionnaire, the SF-12v2, to obtain a health utility index. Using regressions, we estimate the HRQoL loss attributable to gambling addiction, controlling for comorbidities. The second step was to express this loss in monetary terms using the value of a life year (VOLY) estimate. Our main hypothesis was that pathological gambling would be associated with significant HRQoL costs, costs that must be considered in studies of the social cost of gambling.

This study was conducted in Switzerland, where gambling issues are still partly unknown as it is a fairly new concern for policy makers. Only a few studies based on general population surveys have investigated the prevalence of gambling disorders in Switzerland. Using the South Oaks Gambling Screen (SOGS), two prevalence surveys have been performed, the first in 1998 (Bondolfi, Osiek, & Ferrero, 2000) and the second in 2005 (Bondolfi, Jermann, Ferrero, Zullino, & Osiek, 2008). The aim of these surveys was to analyze whether the opening of 19 casinos in Switzerland in 2002 increased the prevalence of pathological gambling. In 2005, the researchers estimated the past year prevalence rate of pathological gambling at 0.5% of the population over 18 years of age compared to 0.8% in 1998. Thus, they could not identify a significant increase in the prevalence of pathological gambling due to the opening of the casinos. In 2007, the Swiss Health Survey (SHS) included some of the DSM-IV criteria to screen for pathological gambling. Using a composite index, the Federal Gaming Board (Eidgenössische Spielbankenkommission, 2009) concluded that 0.5% of the population aged 15 and over could be considered pathological gamblers.

The social burden of this disorder was assessed in three different studies. The first study was mandated by the Federal Gaming Board (Künzi, Fritschi, & Egger, 2004).

The authors determined an annual cost of gambling addiction of CHF 100 million (1 CHF = 1.1 USD). However, they did not consider the HRQoL costs, so this figure was probably largely underestimated. Moreover, this study did not clearly distinguish real costs and transfers. In 2009, the direct and indirect costs of casino gambling in Switzerland were estimated at CHF 69.7 million (Künzi, Fritschi, Oesch, Gehring, & Julien, 2009). More recently, a report based on the present study estimated to direct, indirect and HRQol costs of problem and pathological gambling, and discovered significantly higher costs (Jeanrenaud, Gay, Kohler, Besson & Simon, 2012). In this study, the social burden of problem and pathological gambling was estimated between CHF 550 million and CHF 650 million per year.

Method

Sample and Data Collection

Pathological gamblers were recruited from treatment centers in Western Switzerland. The survey was approved by the ethics committee for clinical research of the Centre Hospitalier Universitaire Vaudois (CHUV) in Lausanne, Switzerland. Five treatment centers collected 52 questionnaires over a one-year period. The questionnaires were completed at the centers according to a standardized protocol. Treatment center staff members were asked to administer the survey as early as possible in the treatment process. Originally, the gambler's relatives were also asked to complete the questionnaires, but the number of responses was too small to proceed with analyses. To obtain a control group, shorter questionnaires were sent to a sample of the Swiss population during the same time period. This sample (n=93) was representative of the Swiss population in terms of age, gender and educational level.

Gambling Behaviour Assessment

As problem gamblers were recruited in treatment centers, they were already screened for their gambling behaviour and identified as problem or pathological gamblers at an early stage of their treatment. However, to validate the treatment center's diagnosis, we included the Lie/Bet questionnaire (Johnson et al., 1997) in our survey. We favoured this instrument because of its brevity: this brevity works to avoid extensive non-responses. Indeed, the two questions of the Lie/Bet questionnaire have been previously shown to be valid in detecting problem or pathological gamblers (Götestam, Johansson, Wenzel, & Simonsen, 2004; Johnson, Hamer, & Nora, 1998). Thus, this questionnaire was implemented only to confirm the first screening conducted by the treatment centers.

Valuation Instrument

A widely used method for assessing quality of life is the "Quality-Adjusted Life Years" (QALY) concept, first introduced by Klarman, Francis, and Rosenthal

(1968) in a cost-effectiveness analysis of the treatment of chronic renal disease. This concept is based on the argument that an individual's well-being is a trade-off between the quantity of years he or she will live, balanced against the quality of those years (Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005). In fact, one year lived in full health does not bring the same utility to an individual as one year lived with a given disability. Values of this utility index can range between 0 and 1, representing the worst possible health state (0), and perfect health (1). The interpretation of a QALY is straightforward: an individual with a life expectancy of ten years with a given disability could experience a utility index of 0.6. This weight means that he gives the same value to ten years lived with his disability and 6 QALY in perfect health. The difference between the health utility (the weight) and 1 (perfect health) represent the decrease of utility an individual experiences each year because of his or her disability. In this study, we aimed to estimate this index to show how the quality of life of pathological gamblers is reduced each year.

In economics two methods are commonly used, specifically the Standard Gamble (SG) and the Time-Trade Off (TTO). The first method is based on the expected utility theory developed by von Neumann and Morgenstern (1944). The second method was developed by Torrance et al. (1972), and can be seen as a simplified version of the Standard Gamble. Both methods present individuals with different choices using probabilities and life expectancy to obtain finally a utility index that is associated with a specific disability. Other methods are based on standard self-completed questionnaires that aim to describe on a scale how impaired an individual is in daily activities and social interaction. This is notably the case of the SF-6D (Short Form-6 dimensions), the HUI (Health Utility Index) or the EQ-5D (EuroQol-5 dimensions). With a specific algorithm it is now possible to assign a utility index value to an individual depending on his or her answers. The principal difference between these questionnaires and the TTO or SG is that they are descriptive, and do not therefore include choices to obtain the health utility index value.

In this study we favoured the second approach, based on standard questionnaires, because of their ease of use, and because no face-to-face contact with the pathological gamblers was needed. Moreover, these multi-item instruments generally contain specific questions regarding mental health. We focused our attention on two widely used questionnaires: the SF-6D (Brazier, Roberts, & Deverill, 2002; Brazier, Usherwood, Harper, & Thomas, 1998) and the EQ-5D (Dolan, Gudex, Kind, & Williams, 1996). Both questionnaires use an algorithm to obtain a single health utility index value for each participant. Although both the SF-6D and EQ-5D are able to discriminate between different health states, they also each contain unique, particular characteristics. The fact that each questionnaire includes unique characteristics has been a matter of interest in recent years (Ariza-Ariza et al., 2006; Barton et al., 2008; Brazier, Roberts, Tsuchiya, & Busschbach, 2004; Longworth & Bryan, 2003; Petrou & Hockley, 2005; Pickard, Johnson, & Feeny, 2005; Sobocki et al., 2007). Probably the most important differences lie in the range of utility scores and the number of health states defined. The EQ-5D describes 243 different health states and can generate a range of utility values between -0.594 (worst health state) and 1 (best health state). The SF-6D can describe 18,000 potential health states and generates utility values from 0.296 (worst health state) to 1 (best health state) (Brazier et al., 2004). Another difference lies in the valuation method used to obtain the two scoring algorithms: whereas the algorithm of the EQ-5D is based on a TTO survey, the SF-6D uses a SG survey.

Because of these differences, the scores of the two instruments each display unique patterns relative to the other. First, EQ-5D scores show a ceiling effect, whereas SF-6D scores show a floor effect (Brazier et al., 2004; Kopec & Willison, 2003), resulting in greater utility scores with EQ-5D than with SF-6D for people in particularly good health. The inverse is true for individuals indicating particularly poor health (Longworth & Bryan, 2003; Petrou & Hockley, 2005). Moreover, the SF-6D mean score is higher than the score produced by the EQ-5D, and the latter exhibits a larger standard deviation (Brazier et al., 2004). Petrou and Hockley (2005) calculated the relative efficiencies of the EQ-5D and SF-6D in detecting minimally important differences in external indicators of health status. The relative efficiency is defined as the ratio of the square of the t-statistic of the comparator (the SF-6D in Petrou & Hockley, 2005) to the square of the t-statistic of the reference instrument (the EQ-5D). Using this measure, Petrou and Hockley (2005) concluded in favour of the SF-6D, which was found to be more efficient than the EQ-5D in detecting differences in self-reported health status. This result is important because it implies that the SF-6D requires a smaller sample size to detect minimally important differences in health outcomes. Moreover, the SF-6D includes more specific items focusing on mental health. Given these important advantages of the SF-6D over the EQ-5D, we chose the SF-6D despite its lower response rate (Barton et al., 2008; Brazier et al., 2004). The SF-6D scores were computed using the QualityMetric Health OutcomesTM Scoring Software 2.0. This instrument makes it possible to compare the HRQoL of pathological gamblers with that of the general population. Thus, using regression analysis, we could estimate the share of the total HRQoL loss attributable to pathological gambling after controlling for comorbidities.

Statistical Analysis

HRQoL as measured by the SF-6D is characterized by a significant floor effect. This means that the true variation among particularly disabled people is not captured, resulting in censored measures. Indeed, the health utility index is not sensitive enough to describe health states below a certain floor threshold. Given this pattern, the use of a tobit regression (Austin, Escobar, & Kopec, 2000; Tobin, 1958) provides unbiased and consistent estimates (Maddala, 1983). Tobin (1958) argues that we must take into account the concentration of observations at the limiting value to estimate the relationship between a limited variable and other explanatory variables. Thus, an independent variable may have an influence on the probability of limit responses and on the size of the non-limit responses. His idea is to combine a probit analysis for the probability of the response being censored and a multiple regression for the value of the response variable by using maximum likelihood estimation. However, this is a parametric model that relies on strong assumptions regarding homoskedasticity and normality of the errors. It has been shown (Arabmazar & Schmidt, 1981) that this model should not be used if these assumptions are not met because inconsistent estimates may result accordingly. Instead, a more robust alternative can be used, such as the censored least absolute deviations estimator (CLAD). This model, introduced by Powell (1984), is an extension of the least absolute deviations (LAD) estimator applied to the censored regression model. Powell (1984) developed a consistent semi-parametric estimator that assumes a functional form only for the regression, but no assumptions are made on the distribution of the residuals. This property makes it superior to the tobit, especially when the errors are not normally distributed (Paarsch, 1984). Moreover, this estimator is also robust to heteroskedasticity.

Variables

Quality of life was measured through a reduced form of the SF-36 (Ware & Gandek, 1994) called the SF-12v2 (Ware, Kosinski, & Keller, 1995). This standardized questionnaire contains 12 items that collectively produce scores on eight dimensions, namely: (1) physical functioning, (2) role physical, (3) bodily pain, (4) general health, (5) vitality, (6) social functioning, (7) role emotional and (8) mental health. The quality of life is estimated through the SF-6D which consists in a combination of these scores into six dimensions—(1) physical functioning, (2) role limitations, (3) social functioning, (4) pain, (5) mental health and (6) vitality—to obtain a health utility index (Brazier et al., 1998; Brazier et al., 2002; Brazier & Roberts, 2004). With this instrument, the impact of various diseases on HRQoL has been estimated, including insomnia (Morgan, Dixon, Mathers, Thompson, & Tomeny, 2003), asthma (Szende, Svensson, Ståhl, Mészáros, & Berta, 2004), stroke (Pickard et al., 2005), obesity (Kortt & Clarke, 2005), age-related macular degeneration (Espallargues et al., 2005; Kortt & Clarke, 2005) and low back pain (Hollingworth et al., 2002). This index was used as the dependent variable in our regressions. Respondents were also asked to rate their health state on a visual analogue scale (VAS) to check the level of adequacy of our heath utility index. The VAS adopted is similar to the EQ-5D VAS (Dolan et al., 1996).

To control the regression, we screened for the comorbidities commonly associated with pathological gambling. Alcohol abuse was identified using the CAGE questionnaire (Mayfield, McLeod, & Hall, 1974) with a cut-off point of two and over. Given the high rate of depression among pathological gamblers, we also screened for this particular mood disorder by using the Patient Health Questionnaire 2 items (PHQ-2) (Kroenke, Spitzer, & Williams, 2003; Whooley, Avins, Miranda, & Browner, 1997). We favoured this instrument because of its brevity and its efficacy in detecting depression. Drug abuse and tobacco consumption were assessed with closed questions. A dummy variable was created for each of these comorbidities. To obtain some sense of the causal path between pathological gambling and these comorbidities, we asked respondents whether they had started to experience these disorders before or after the onset of their gambling addiction. The latter was considered auxiliary information that was not used in this research to make a definitive statement regarding causality.

Respondents were also screened for chronic diseases by asking if they were being treated or had ever been treated for a diverse set of chronic diseases, specifically, and as categorized, migraine, asthma, diabetes, osteoarthritis/arthritis, gastric/duodenal ulcers, osteoporosis, chronic bronchitis/emphysema, hypertension, myocardial infarction, heart attack, kidney disease/kidney stones, cancer/tumors, and hay fever/other allergies. As this list is not exhaustive, a field named "other" was added to determine the presence of other diseases. Finally, we asked an open-ended question about whether the respondent suffered from any chronic physical disability. Because of the sample size, we could not create a dummy variable for each of the chronic diseases. Instead, the chronic diseases and physical disability were grouped into one dummy variable indicating whether the individual had ever suffered from any of them. To control for age, we constructed three age groups representing individuals aged 18 to 35 years, 36 to 55 years, and over 55 years, respectively.

Results

Descriptive Statistics

In this analysis, we collected 52 questionnaires from pathological gamblers in treatment. All subjects were also identified as problem or pathological gamblers according to the Lie/Bet questionnaire. For the control group, 93 individuals from the general population were interviewed, resulting in a total of 145 questionnaires across the two samples combined. The health utility index is summarized in Table 1. As expected, this index shows a strong correlation of $r = 0.67$ with the VAS, attesting to its validity.

Table 1
Descriptive statistics of the health utility index

	Control group (n=93)		Pathological gamblers (n=52)		
Dependent variable	Mean	Std. deviation	Mean	Std. deviation	*F* *(ANOVA)*
Health Utility Index (SF-6D)	0.742	0.113	0.623	0.089	42.399**

* p< .05; ** p< .01

Table 1 shows a significantly lower quality of life among the pathological gamblers than among the control group. Indeed, pathological gamblers showed a mean quality of life 0.12 units lower than that of the control group. At this stage of the analysis, this difference was not surprising because pathological gamblers experience higher rates of comorbidity relative to the control group. Table 1 showed an average health utility index for the control group at 0.742. Interestingly, using EQ-5D, the health utility of the general population in the French-speaking part of Switzerland was somewhat higher and estimated at 0.83 (Perneger, Combescure, & Courvoisier, 2010). However, as we assessed our utility index with the same instrument (SF-6D) for our pathological gambler and control samples, this pattern would not influence the results. Indeed, if there was to be a bias, it would instead be observed for the two samples, and thus the differences between the two would not be influenced accordingly. At this stage, a more detailed analysis using regression methods is needed to estimate the amount of this group difference that is attributable to pathological gambling.

The descriptive statistics for the independent variables are presented in Table 2. According to the univariate analysis of the χ^2 statistics, all the categorical variables except age group exhibited some significant differences between the control group and the pathological gamblers. The pathological gamblers were more likely to suffer from any of the screened chronic diseases or from physical disability. Indeed, only 43.0% of the control group reported any health problems, compared to 63.3% of the pathological gamblers. The proportion of smokers among pathological gamblers was more than twice that of the control group. Moreover, 44.2% of the pathological gamblers were identified as suffering from depression, according to the PHQ-2 screening questionnaire. This proportion was about twice as high as the proportion

Table 2
Descriptive statistics of the variables

Variables	Control group (n=93) %	Pathological gamblers (n=52) %	χ^2
Age			
18–35	31.2	19.2	2.4
36–55	46.2	55.8	1.2
56 and over	22.6	25.0	0.1
Any chronic disease or physical disability	43.0	63.3	5.1*
Smoking status			
Smoker	33.3	76.9	
Non-smoker	66.7	23.1	25.4**
Depression (PHQ-2)	22.8	44.2	7.2**
CAGE			
< 2	87.1	56.9	
≥ 2	12.9	43.1	16.7**

* $p < .05$; ** $p < .01$

identified among the control group. According to the CAGE screening questionnaire, pathological gamblers also exhibited a rate of alcohol abuse more than three times the rate reported by the control group.

HRQoL Loss Attributable to Gambling Addiction

To estimate the loss of quality of life attributable to gambling addiction, we ran three regressions: an ordinary least squares (OLS) regression, a tobit regression, and a CLAD. In our sample, no respondent had the worst possible health state detectable with the SF-6D. However, one individual had a health utility index of one, characterizing perfect health. Because of this pattern, we decided to use a right censoring for the tobit and the CLAD regression for this value. We controlled the regressions for age, tobacco and alcohol consumption and the screened comorbidities. The results of the regressions are presented in Table 3.

The coefficients of the three models showed the same patterns. Moreover, the models were shown to be valid according to either the F or the χ^2 fit statistic. No significant effect of age group was found on the health utility index. Problematic alcohol consumption, as screened by the CAGE, decreased quality of life significantly, by 0.043 for the OLS, 0.044 for the tobit model, and 0.047 for the CLAD. In these regressions, smoking status did not seem to have a significant influence on the health utility index. However, a depression diagnosis significantly affected quality of life across all respondents. This effect was the largest of the analysis, decreasing the QALY by 0.099 (OLS and tobit) to 0.102 (CLAD). Having any chronic disease or physical disability also negatively affected the health utility

Table 3

OLS, tobit and CLAD regressions modeling the impacts of demographics, gambling addiction and comorbidities on the health utility index

	OLS		Tobit		CLAD	
Variables	Coeff.	Std. dev.	Coeff.	Std. dev.	Coeff.	Std. dev.
Age (ref: 18–35)						
36–55	0.012	0.021	0.013	0.021	0.012	0.033
56 and over	0.010	0.027	0.012	0.026	0.003	0.041
Depression symptoms[a]	−0.099**	0.018	−0.099**	0.018	−0.102**	0.023
Any chronic disease or physical disability	−0.056**	0.020	−0.057**	0.019	−0.069*	0.031
CAGE	−0.043*	0.020	−0.044*	0.020	−0.047*	0.024
Smoker	−0.002	0.018	−0.002	0.018	−0.009	0.023
Pathological gambler	−0.081**	0.020	−0.081**	0.020	−0.071**	0.025
Constant	0.792**	0.018	0.793**	0.017	0.797**	0.025

[a] Measured using the PHQ-2

* p< .05; ** p< .01;

index. Again, the impact was larger for the CLAD estimates than for the OLS and tobit regressions. Finally, being a pathological gambler had a significant negative impact on quality of life, decreasing the QALY by 0.081 (OLS and Tobit) to 0.071 (CLAD). The results of the three regressions were highly convergent. The explanation for this pattern lay in the censored values. Indeed, in our data, only one observation had health utility index of 1 and none reached the floor value.

Interestingly, the constant term was significant but not equal to 1. However, it would be reasonable to assume that an individual, who is between 18 and 35 years old, does not have any depression symptoms or problematic alcohol consumption, does not smoke, is not a pathological gambler and does not have any chronic disease or physical disability should have a health utility index of 1. Thus, a second set of OLS and tobit regressions was done, constraining the constant term to be equal to 1. The results are presented in Table 4.

Interestingly, adding this constraint increased the impacts of almost all variables on the health utility index. Moreover, increasing age as well as tobacco use, now significantly decreased quality of life. The impact of pathological gambling on HRQoL decreased slightly in these models, but the statistical effect remained highly significant. It is worth noting that the coefficients for pathological gambling remained very similar to the coefficients obtained in the unconstrained regressions. Again, the fit statistics showed that the models were valid.

In the two sets of regressions, we controlled for the influence of the different co-occurring health problems on HRQoL. Thus, to keep estimates conservative we assumed that none of these disorders resulted from gambling addiction. However,

Table 4
OLS and tobit regressions modeling the impacts of demographics, gambling addiction and comorbidities on the health utility index with the constant term equal to 1

	OLS		Tobit	
Variables	Coeff.	Std. dev.	Coeff.	Std. dev.
Age (ref:18–35)				
36–55	−0.132**	0.025	−0.131**	0.025
56 and over	−0.128**	0.034	−0.123**	0.034
Depression symptoms (PHQ-2)	−0.146**	0.026	−0.146**	0.025
Any chronic disease or physical disability	−0.068*	0.028	−0.070*	0.028
CAGE	−0.059*	0.029	−0.060*	0.028
Smoker	−0.081*	0.024	−0.082**	0.024
Pathological gambler	−0.076*	0.029	−0.076**	0.028
Constant	1.0	n.a	1.0	n.a

* p< .05; ** p< .01

the questions related to the relative order of onset of the different comorbid disorders reported by problem or pathological gamblers highlights some interesting patterns. Particularly among the depression diagnoses where 72.7% of the patients declared that these symptoms followed the onset of their gambling problems, suggesting that for many pathological gamblers comorbid depression should be considered when calculating the social costs of pathological gambling. Results were much less pronounced for alcohol and tobacco. Regarding alcohol consumption, only 14.3% reported an increase in their alcohol consumption since the onset of their excessive gambling behaviour with the same percentage, indicating that their alcohol consumption had decreased. For tobacco consumption, only 12.5% of the disordered gamblers began to smoke after their gambling problems appeared while 11.6% were smokers before their gambling problems and stopped after the onset of the latter.

Monetary Value of the HRQoL Loss

The statistical analysis allowed us to estimate the HRQoL loss suffered by the pathological gamblers. According to the constrained tobit coefficients, pathological gamblers' quality of life score was lowered by 0.076. The final step of this estimation was to obtain a monetary value for this loss.

Several studies have estimated the VOLY (Abelson, 2003; Chilton, Covey, Jeanrenaud, & Marti, 2007, July; Jones-Lee, Loomes, & Metcalf, 2004; National Public Health Partnership, 2003; Scapecchi, 2007; Soguel & van Griethuysen, 2000). VOLY represents the monetary value individuals attach to a year lived in full health. If we combine the loss of quality of life due to pathological gambling with the VOLY estimated for the Swiss population, we obtain the HRQoL costs resulting from pathological gambling.

Jeanrenaud and Marti (2007, July) estimated the VOLY for the Swiss population. They obtained one estimate of CHF 80,000 and another of CHF 50,400 as the value of a year lived in good health (1 CHF = 1.1 USD). To produce a conservative estimate, we used the lower value of 50,400 CHF. This value was in line with a European study that estimated the VOLY for air pollution at 40,000€ (Desaigues et al., 2011). To obtain the annual HRQoL costs for an addicted gambler, we multiplied the Swiss value by the constrained tobit coefficient (0.076), resulting in a cost of CHF 3,830 per pathological gambler per annum. Using a 95% confidence interval, we obtained a cost range between CHF 1,058 and CHF 6,653 per gambler, per annum (Table 5).

Discussion and Limitations

In this study, we assessed the HRQoL costs of pathological gambling using a health utility index. To our knowledge, this was the first time such a health utility index had been estimated for this specific population. Moreover, we were able to assess the net

Table 5
Annual HRQoL costs of pathological gambling

	Lower bound *	Reference estimate	Upper bound *
Tobit constrained coefficients	0.021	0.076	0.132
Value of a life year (VOLY)		CHF 50,400	
Annual HRQoL costs of pathological gambling (CHF)[a]	1,058.40	3,830.40	6,652.80

[a] 1 CHF = 1.1 USD; *α=0.05

impact of pathological gambling since we controlled for the impact of the different co-occurring disorders. In line with our initial hypothesis, pathological gambling was shown to be associated with a significant loss of quality of life. Furthermore, the different specifications of the regression models did not influence the HRQoL attributable to pathological gambling, suggesting that the findings are robust. Using the VOLY, we estimated the HRQoL costs to be between CHF 1,058 and CHF 6,653, with a reference estimate of CHF 3,830 per year per addicted gambler. Based on the present results, a recent study estimated the annual cost of gambling disorders (Jeanrenaud et al., 2012) in Switzerland. According to this report, the HRQol costs represented between 20% and 30% of the total social cost. This proportion was lower than that presented by the Australian Government Productivity Commission study in its report (1999), which found that this cost accounted for more than 90% of the total social cost. However, both studies agree that a significant part of the total social costs of pathological gambling is attributable to the loss of quality of life associated with this disorder.

A secondary objective of this study was to test a simple tool for estimating a health utility index. As the SF-6D seems to be sensitive enough for this specific population, future estimates of the social cost of gambling addiction can be made more accurate by including the HRQoL costs. Thus, these standardized questionnaires may prove an interesting and more convenient alternative to such traditional economic tools as the Time Trade-Off or Standard Gamble.

In this paper, we endeavored to use conservative values for the VOLY to estimate the monetary value of the HRQoL loss. However, in our sample, 72.7% of the pathological gamblers who suffered from depression declared that their depressive symptoms were a consequence of their gambling addiction. This conclusion was consistent with the results of a study by McCormick et al. (1984). Therefore, it might be argued that to produce a more comprehensive estimation of the quality of life impact of pathological gambling, part of the utility loss due to depression (0.15) should be attributed to gambling addiction. Moreover, the regressions were controlled for all comorbidities. This fact implies that all comorbidities are treated as co-occurring health problems and thus not as a negative side-effect of gambling addiction. Using this process allowed us to obtain the most conservative estimates of the HRQoL loss attributable to pathological gambling. However, further research based on longitudinal data should focus on the causal pathways between gambling addiction and the different comorbidities to enable a more precise estimation of the loss of quality of life created by pathological gambling. Finally, the relatives of the gamblers were not included in this analysis. However, as shown in the Productivity Commission study (1999), the relatives of pathological gamblers also suffer from a loss of quality of life, which should be taken into account to achieve a comprehensive estimate of the HRQoL costs of gambling addiction.

The results of this analysis should be considered with three main limitations in mind. First, because of the specificity of this analysis, pathological gamblers were not drawn from a random and representative sample. As the proportion of problem gamblers that turned to treatment centers was low, sampled individuals may not have been representative of the average problem gambler. We expected them to suffer from a larger loss of quality of life. However, as we used conservative estimates, this bias was partly mitigated accordingly. Second, the size of our sample was limited to 145 individuals. In fact, pathological gamblers are hard to reach. Indeed, between 1% and 2% of the population suffer from this disorder, and it has been shown that only about 1% of them present for treatment. As a matter of fact, only a particularly small number of consultations are registered for this specific disorder. Moreover, pathological gamblers may consult their own therapist and not turn to centers specifically dedicated to the treatment of gambling problems. Thus, only 52 questionnaires were gathered from pathological gamblers during the investigation period among the treatment centers. Finally, we investigated the most commonly accepted comorbidities and did not screen for more specific mood or anxiety disorders such as hypomania or posttraumatic stress disorder as the associations with pathological disorder are mixed.

Despite these few limitations, the interesting conclusions of this first study should encourage a larger survey investigating this topic based on a large and representative sample of the population.

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References

Abelson, P. (2003). The value of life and health for public policy. *Economic Record, 79,* 2–13. doi: 10.1111/1475-4932.00087

Arabmazar, A., & Schmidt, P. (1981). Further evidence on the robustness of the Tobit estimator to heteroskedasticity. *Journal of Econometrics, 17*(2), 253–258. doi: 10.1016/0304-4076(81)90029-4

Ariza-Ariza, R., Hernández-Cruz, B., Carmona, L., Dolores, R. M., Ballina, J., & Navarro-Sarabia, F. (2006). Assessing utility values in rheumatoid arthritis: A comparison between time trade-off and the EuroQol. *Arthritis Care and Research, 55*(5), 751–756. doi:10.1002/art.22226

Austin, P. C., Escobar, M., & Kopec, J. A. (2000). The use of the Tobit model for analyzing measures of health status. *Quality of Life Research, 9*(8), 901–910.

Barton, G. R., Sach, T. H., Avery, A. J., Jenkinson, C., Doherty, M., Whynes, D. K., & Muir, K. R. (2008). A comparison of the performance of the EQ-5D and SF-6D for individuals aged >or=45 years. *Health Economics, 17*(7), 815–832.

Becker, G. S., & Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy, 96*(4), 675–700.

Black, D. W., Moyer, T., & Schlosser, S. (2003). Quality of life and family history in pathological gambling. *Journal of Nervous and Mental Disease, 191*(2), 124–126. doi: 10.1097/01.NMD.0000050942.86352.47

Bland, R. C., Newman, S. C., Orn, H., & Stebelsky, G. (1993). Epidemiology of pathological gambling in Edmonton. *Canadian Journal of Psychiatry, 38*(2), 108–112.

Bondolfi, G., Jermann, F., Ferrero, F., Zullino, D., & Osiek, C. (2008). Prevalence of pathological gambling in Switzerland after the opening of casinos and the introduction of new preventive legislation. *Acta Psychiatrica Scandinavica, 117*(3), 236–239. doi: 10.1111/j.1600-0447.2007.01149.x

Bondolfi, G., Osiek, C., & Ferrero, F. (2000). Prevalence estimates of pathological gambling in Switzerland. *Acta Psychiatrica Scandinavica, 101*(6), 473–475.

Brazier, J. E., & Roberts, J. (2004). The estimation of a preference-based measure of health from the SF-12. *Medical Care, 42*(9), 851–859.

Brazier, J., Roberts, J., & Deverill, M. (2002). The estimation of a preference-based measure of health from the SF-36. *Journal of Health Economics, 21*(2), 271–292.

Brazier, J., Roberts, J., Tsuchiya, A., & Busschbach, J. (2004). A comparison of the EQ 5-D and SF-6D across seven patient groups. *Health Economics, 13*(9), 873–884.

Brazier, J., Usherwood, T., Harper, R., & Thomas, K. (1998). Deriving a preference-based single index from the UK SF-36 Health Survey. *Journal of Clinical Epidemiology, 51*(11)*,* 1115–1128.

Chilton, S., Covey, J., Jones-Lee, M., Loomes, G., & Metcalf, H. (2004). *Valuation of health benefits associated with reduction in air pollution: Final report*. London, England: Department for Environment Food and Rural Affairs.

Collins, D. J., & Lapsley, H. M. (2002). *Counting the cost: Estimates of the social costs of drug abuse in Australia in 1998-9* (Monograph Series No. 49). Canberra, Australia: Commonwealth Department of Health and Ageing.

Cunningham-Williams, R. M., Cottler, L. B., Compton, W. M., & Spitznagel, E. L. (1998). Taking chances: Problem gamblers and mental health disorders: Results from the St. Louis Epidemiologic Catchment Area Study. *American Journal of Public Health, 88*(7)*,* 1093–1096.

Desaigues, B., Ami, D., Bartczak, A., Braun-Kohlová, M., Chilton, S., Czajkowski, M., … Urban, J. (2011). Economic valuation of air pollution mortality: A 9-country contingent valuation survey of value of a life year (VOLY). *Ecological Indicators, 11*(3)*,* 902–910.

Dolan, P., Gudex, C., Kind, P., & Williams, A. (1996). The time trade off method: Results from a general population study. *Health Economics, 5*(2)*,* 141–154.

Drummond, M. F., Sculpher, M. J., Torrance, G. W., O'Brien, B.J., & Stoddart, G. L. (2005). *Methods for the economic evaluation of health care programmes* (3rd ed.). New York, NY: Oxford University Press.

Eidgenössische Spielbankenkommission. (2009). *Glücksspiel: Verhalten und Problematic in der Schweiz*. Bern, Switzerland: ESBK.

Erickson, L., Molina, C. A., Ladd, G. T., Pietrzak, R. H., & Petry, N. M. (2005). Problem and pathological gambling are associated with poorer mental and physical health in older adults. *International journal of geriatric psychiatry, 20,* 754–759.

Espallargues, M., Czoski-Murray, C. J., Bansback, N. J., Carlton, J., Lewis, G. M., Hughes, … & Brazier, J. E. (2005). The impact of age-related macular degeneration on health status utility values. *Investigative Ophthalmology and Visual Science, 46*(11)*,* 4016–4023.

Fong, D. K. C., Fong, H. N., & Li, S. Z. (2011). The social cost of gambling in Macao: Before and after the liberalisation of the gaming industry. *International Gambling Studies, 11*(1)*,* 43–56. doi: 10.1080/14459795.2010.548393

Fong, T. W., Campos, M. D., Brecht, M. L., Davis, A., Marco, A., Pecanha, V., & Rosenthal, R. J. (2011). Problem and pathological gambling in a sample of casino patrons. *Journal of Gambling Studies, 27*(1), 1–13. doi: 10.1007/s10899-010-9200-6

Gerstein, D. R., Hoffmann, J., Larison, C., Engelman, L., Murphy, S., Palmer, A., Chuchro, L., … & Sinclair, S. (1999). *Gambling impact and behavior study: Report to the National Gambling Impact Study Commission*. Chicago, IL: National Opinion Research Center.

Götestam, K. G., Johansson, A., Wenzel, H. G., & Simonsen, I. E. (2004). Validation of the lie/bet screen for pathological gambling on two normal population data sets. *Psychological Reports, 95*(3, pt. 1), 1009–1013. doi: 10.2466/pr0.95.3.1009-1013

Hollingworth, W., Deyo, R. A., Sullivan, S. D., Emerson, S. S., Gray, D. T., & Jarvik, J. G. (2002). The practicality and validity of directly elicited and SF-36 derived health state preferences in patients with low back pain. *Health Economics, 11*(1), 71–85.

Jeanrenaud, C., Gay, M., Kohler, D., Besson, J., & Simon, O. (2012). *Le coût social du jeu excessif en Suisse*. Neuchâtel, Switzerland: Institut de recherches économique de Neuchâtel: Centre du jeu excessif.

Jeanrenaud, C., & Marti, J. (2007, July). *The cost of reduced life expectancy due to air pollution: Assessing the Value of a Life Year (VOLY) using contingent valuation*. Paper presented at the IHEA 6th World Congress, Copenhagen, Denmark.

Johansson, A., Grant, J. E., Kim, S. W., Odlaug, B. L., & Götestam, K. G. (2009). Risk factors for problematic gambling: A critical literature review. *Journal of Gambling Studies, 25*(1), 67–92. doi: 10.1007/s10899-008-9088-6

Johnson, E. E., Hamer, R. M., & Nora, R. M. (1998). The Lie/Bet Questionnaire for screening pathological gamblers: A follow-up study. *Psychological Reports, 83,* 1219–1224.

Johnson, E. E., Hamer, R., Nora, R. M., Tan, B., Eisenstein, N., & Engelhart, C. (1997). The Lie/Bet questionnaire for screening pathological gamblers. *Psychological Reports, 80*(1), 83–88.

Kessler, R. C., Hwang, I., Labrie, R., Petukhova, M., Sampson, N. A., Winters, K. C., & Shaffer, H. J. (2008). DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychological Medicine, 38,* 1351–1360.

Klarman, H. E., Francis, J. O., & Rosenthal, G. D. (1968). Cost effectiveness analysis applied to the treatment of chronic renal disease. *Medical Care, 6*(1), 48–54.

Kopec, J. A., & Willison, K. D. (2003). A comparative review of four preference-weighted measures of health-related quality of life. *Journal of Clinical Epidemiology, 56*(4), 317–325.

Kortt, M. A., & Clarke, P. M. (2005). Estimating utility values for health states of overweight and obese individuals using the SF-36. *Quality of Life Research, 14*(10), 2177–2185. doi: 10.1007/s11136-005-8027-6

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2003). The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Medical Care, 41*(11), 1284–1292.

Künzi, K., Fritschi, T., & Egger, T. (2004). *Glücksspiel und Spielsucht in der Schweiz: Empirische Untersuchung von Spielpraxis, Entwicklung, Sucht und Konsequenzen*. Bern, Switzerland: Büro für Arbeits- und Sozialpolitische Studien.

Künzi, K., Fritschi, T., Oesch, T., Gehring, M., & Julien, N. (2009). *Soziale Kosten des Glücksspiels in Casinos: Studie zur Erfassung der durch Schweizer Casinos verursachten sozialen Kosten*. Bern, Switzerland: Büro für Arbeits- und Sozialpolitische Studien.

Lin, E. Y. J., Casswell, S., Easton, B., Huckle, T., Asiasiga, L., & You, R. Q. (2010). Time and money spent gambling and the relationship with quality-of-life measures: A national study of New Zealanders. *Journal of Gambling Issues,* (24), 33–53. doi: 10.4309/jgi.2010.24.4

Longworth, L., & Bryan, S. (2003). An empirical comparison of EQ-5D and SF-6D in liver transplant patients. *Health Economics, 12*(12), 1061–1067. doi: 10.1002/hec.787

Maddala, G. S. (1983). *Limited-dependent and qualitative variables in econometrics* (Econometric Society Monographs). Cambridge: Cambridge University Press.

Mayfield, D., McLeod, G., & Hall, P. (1974). The CAGE questionnaire: Validation of a new alcoholism screening instrument. *American Journal of Psychiatry, 131*(10), 1121–1123.

McCormick, R. A., Russo, A. M., Ramirez, L. F., & Taber, J. I. (1984). Affective disorders among pathological gamblers seeking treatment. *American Journal of Psychiatry, 141*(2), 215–218.

Momper, S. L., Delva, J., Grogan-Kaylor, A., Sanchez, N., & Volberg, R. A. (2010). The association of at-risk, problem, and pathological gambling with substance use, depression, and arrest history. *Journal of Gambling Issues* (24), 7–32. doi: 10.4309/jgi.2010.24.3

Morasco, B. J., & Petry, N. M. (2006). Gambling problems and health functioning in individuals receiving disability. *Disability and Rehabilitation, 28,* 619–623.

Morasco, B. J., Pietrzak, R. H., Blanco, C., Grant, B. F., Hasin, D., & Petry, N. M. (2006a). Health problems and medical utilization associated with gambling disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychosomatic Medicine, 68*(6)*,* 976–984.

Morasco, B. J., Vom Eigen, K. A., & Petry, N. M. (2006b). Severity of gambling is associated with physical and emotional health in urban primary care patients. *General Hospital Psychiatry, 28*(2)*,* 94–100.

Morgan, K., Dixon, S., Mathers, N., Thompson, J., & Tomeny, M. (2003). Psychological treatment for insomnia in the management of long-term hypnotic drug use: A pragmatic randomised controlled trial. *British Journal of General Practice, 53,* 923–928.

National Public Health Partnership. Department of Health and Ageing and EnHealth Council. (2003). *Guidelines for economic evaluation of environmental health planning and assessment* (Vol. 1: *The Guidelines*). Canberra, Australia: The Department.

Paarsch, H. J. (1984). A Monte Carlo comparison of estimators for censored regression models. *Journal of Econometrics, 24*(1–2)*,* 197–213. doi: 10.1016/0304-4076(84)90079-4

Perneger, T. V., Combescure, C., & Courvoisier, D. S. (2010). General population reference values for the French version of the EuroQol EQ 5D health utility instrument. *Value in Health, 13*(5)*,* 631–635. doi: 10.1111/j.1524-4733.2010.00727.x

Petrou, S., & Hockley, C. (2005). An investigation into the empirical validity of the EQ-5D and SF-6D based on hypothetical preferences in a general population. *Health Economics, 14*(11)*,* 1169–1189. doi: 10.1002/hec.1006

Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment*. Washington, DC: American Psychological Association.

Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 66*(5)*,* 564–574.

Pickard, A. S., Johnson, J. A., & Feeny, D. H. (2005). Responsiveness of generic health-related quality of life measures in stroke. *Quality of Life Research, 14*(1)*,* 207–219.

Pietrzak, R. H., Molina, C. A., Ladd, G. T., Kerins, G. J., & Petry, N. M. (2005). Health and psychosocial correlates of disordered gambling in older adults. *American Journal of Geriatric Psychiatry, 13*(6), 510–519.

Politzer, R. M., Morrow, J. S., & Leavey, S. B. (1981, Fall/Winter). *Report on the societal cost of pathological gambling and the cost-benefit/effectiveness of treatment*. Paper presented at the 5th National Conference on Gambling and Risk Taking, Reno, NV.

Powell, J. L. (1984). Least absolute deviations estimation for the censored regression model. *Journal of Econometrics, 25*(3), 303–325.

Productivity Commission. (1999). *Australia's gambling industries* (Vol. 1) (Report No. 10). Canberra, Australia: AusInfo.

Scapecchi, P. (2007). Use of evaluation tools in policy-making and health implications for children. Paris: Organisation for Economic Co-operation and Development.

Scherrer, J. F., Xian, H., Shah, K. R., Volberg, R., Slutske, W., & Eisen, S. A. (2005). Effect of genes, environment, and lifetime co-occurring disorders on health-related quality of life in problem and pathological gamblers. *Archives of General Psychiatry, 62*(6), 677–683.

Schwer, R. K., Thompson, W. N., & Nakamuro, D. (2003, February). *Beyond the limits of recreation: Social costs of gambling in southern Nevada*. Paper presented at the Far West and American Popular Culture Association Annual Meeting, Las Vegas, NV.

Single, E., Collins, D., Easton, B., Harwood, H., Lapsley, H., Kopp, P., & Wilson, E. (2001). *International guidelines for estimating the costs of substance abuse: 2001 edition*. Organización Mundial de la Salud.

Sobocki, P., Ekman, M., Ågren, H., Krakau, I., Runeson, B., Mårtensson, B., & Jönsson, B. (2007). Health-related quality of life measured with EQ-5D in patients treated for depression in primary care. *Value in Health, 10*(2), 153–160. doi: 10.1111/j.1524-4733.2006.00162.x

Soguel, N., & van Griethuysen, P. (2000). *Evaluation contingente, qualité de l'air et santé: Une étude en milieu urbain* (Cahiers de l'IDHEAP No. 185). Lausanne, Switzerland: Institut des hautes études en administration publique, Université de Lausanne.

Szende, A., Svensson, K., Ståhl, E., Mészáros, A., & Berta, G. Y. (2004). Psychometric and utility-based measures of health status of asthmatic patients with different disease control level. *PharmacoEconomics, 22*(8)*,* 537–547. doi: 10.2165/00019053-200422080-00005

Thompson, W. N., Gazel, R., & Rickman, D. (1996). *The social costs of gambling in Wisconsin* (Vol. 9, No. 6). Thiensville, WI: Wisconsin Policy Research Institute.

Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica, 26*(1)*,* 24–36.

Torrance, G. W., Thomas, W. H., & Sackett, D. L. (1972). A utility maximization model for evaluation of health care programs. *Health Services Research, 7*(2): 118–133.

von Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton, NJ: Princeton University Press.

Ware, J. E., & Gandek, B. (1994). The SF-36 Health Survey: Development and use in mental health research and the IQOLA Project. *International Journal of Mental Health, 23*(2)*,* 49–73.

Ware, J. E., Kosinski, M., & Keller, S. D. (1995). *How to score the SF-12 physical and mental health summary scales*. Boston, MA: The Health Institute, New England Medical Center.

Welte, J., Barnes, G., Wieczorek, W., Tidwell, M. C., & Parker, J. (2001). Alcohol and gambling pathology among U.S. adults: Prevalence, demographic patterns and comorbidity. *Journal of Studies on Alcohol and Drugs, 62*(5)*,* 706–712.

Westphal, J., & Johnson, L. J. (2007). Multiple co-occurring behaviours among gamblers in treatment: Implications and assessment. *International Gambling Studies, 7*(1)*,* 73–99. doi: 10.1080/14459790601157905

Westphal, J. R., Johnson, L. J., & Stevens, L. (1999). *Estimating the social costs of gambling disorders in Louisiana for 1998*. Shreveport, LA: Louisiana State University Medical Center, Gambling Studies Unit.

Whooley, M. A., Avins, A. L., Miranda, J., & Browner, W. S. (1997). Case-finding instruments for depression: Two questions are as good as many. *Journal of General Internal Medicine, 12*(7)*,* 439–445. doi: 10.1046/j.1525-1497.1997.00076.x

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