Eur J Health Econ (2015) 16:347–356
DOI 10.1007/s10198-014-0627-z

ORIGINAL PAPER

Using the SF-6D to measure the impact of alcohol dependence on health-related quality of life

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Received: 30 December 2013 / Accepted: 19 August 2014 / Published online: 6 September 2014

Abstract Alcohol dependence not only reduces life expectancy, but also causes considerable loss of quality of life of the dependents of and persons around those with alcohol dependence. This article presents new evidence on the impact of alcohol dependence on health-related quality of life in Spain. Three samples were recruited: 150 alcoholics and 64 family members of alcoholics, with both samples taken from an alcoholism treatment unit, and 600 persons from the general population. We used the short form 6D, a preference-based generic instrument, applying the utility scores estimated for Spain. It was found that the annual mean loss of quality-adjusted life years associated with alcohol dependence was 0.144 and 0.083 for the alcoholics and their close family members, respectively. This impact becomes more notable after controlling for socio economic variables and was higher than that estimated in similar studies. Possible explanations for these differences are discussed. The results from this work can be applied to economic evaluation studies measuring benefits from policies targeted at reducing the prevalence of alcohol dependence.

Keywords Alcohol dependence · SF-6D · Quality-adjusted life year · Spain

JEL Classification I1

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Introduction

The abusive consumption of alcohol, particularly when it has reached the point of alcoholic dependence, has countless effects on health. Indeed, alcohol is the third leading health risk factor after tobacco and hypertension [1] and the second major contributor to years of life with disability in males, after depressive disorders [2]. Various studies that have analyzed these effects have quantified their impact on life expectancy [3–6], as well as on health-related quality of life (HRQL). Impact on HRQL is often estimated using a variety of non–preference-based generic instruments, such as the 36-item Short-Form Health Survey (SF-36) [7–11], the 12-item Short-Form Health Survey (SF-12) [12], or an alcohol-specific variant of the SF-36, developed by Malet et al. [13]. However, the values obtained from these instruments are not suitable for prioritizing health resources [14, 15]. They are not based on a preference elicitation task that reflects strength of preferences for quality of life, and therefore a higher score (from aggregation of scores across dimensions) is not necessarily associated with more preferred outcomes. For this reason, other measures are recommended in the various areas of substance dependence research [16–19]. One of the most frequently used is quality-adjusted life years (QALYs), as recommended by the National Institute for Health and Care Excellence [20]. This measure estimates HRQL using utility scores, where 0 indicates death and 1 indicates good health.

Different approaches have been used to measure the impact of alcohol dependence in utility scores. Some studies use direct methods (time trade-off, standard gamble, etc.) to measure related-alcohol health states utilities. Although there is much variability in the results, between studies [21–23] as well as within the same study when applying different methodologies [21, 22], the estimates

often show that alcohol dependence, when compared to good health, incurs a quality of life loss greater than 0.3 QALYs per year. Other studies measure utility scores with indirect methods; that is, using multi-attribute questionnaires, the most notable being the short form 6D (SF-6D) [24, 25] and the EuroQol-5D (EQ-5D) [26, 27]. These studies, however, do not analyze the effects of alcohol on quality of life of the dependent population in relation to the general population, but rather, analyze the effects produced by different interventions on the dependent population. To the best of our knowledge, only three studies have used multi-attribute questionnaires to measure the HRQL of heavy drinkers relative to the rest of the general population [28–30]. Although these studies used the EQ-5D as the instrument of measure, they obtained contradictory results. In the study of Saarni et al. [28], conducted with a representative sample from the Finnish population, no relevant differences were detected between the HRQL of the general population and people with alcohol dependence. In the Maheswaran et al. study [29], conducted with a representative sample from the English population, it was found that in comparison to never drinking, harmful alcohol consumption (we are not able to distinguish who is dependent) was associated with a positive impact on HRQL (no relevant differences after adjusting for sociodemographic and health-related confounders). Finally, in the study of Petrie et al. [30], using an Australian rural population sample, a significant impact was found, mainly for very-high-risk drinkers.

Although the literature has concentrated on analyzing the relationship between alcohol misuse and drinkers' HRQL, excessive consumption or dependence can also significantly affect persons around those with alcohol dependence [31, 32]. In our review of the literature, we found only one study that analyses the impact of alcohol dependence on the HRQL of persons around the dependent [33]. In that study, however, calculation of the impact on the quality of life of family members and friends of alcoholics was carried out using the WHOQOL-BREF, an instrument that, as pointed out by the authors themselves, does not allow for the estimation of QALYs, making it unsuitable for use in economic evaluation.

The objective of our study is to provide new empirical evidence about the effects of alcohol dependence on the HRQL of the dependent person and those around them, using the general population as the control group. To do so, the HRQL of a sample of the general population of Galicia (a north-western Spanish region) was compared with the HRQL of a sample of patients from the same region, diagnosed to be suffering from alcohol dependence, and their family members. The instrument applied to derive the utilities scores was the SF-6D [34]. To the best of our knowledge, no other study has applied the SF-6D with the objective of measuring the impact of alcohol dependence on HRQL using a sample from the general population as the control group.

Materials and methods

Sample

To analyze the effects of alcohol dependence, the HRQL was obtained for three samples: 150 patients with alcohol dependence, 64 family members of patients with alcohol dependence, and 600 persons from the general population. The sample of patients and family members was recruited from a standard alcoholism treatment unit within the public health system. This sample was obtained from a contingent valuation study (in progress) in which the SF-36 questionnaire was also used. The group of patients includes all those coming in for a consultation beginning on January 20, 2010, until a sample of 150 subjects was obtained (about 30 % of the patients annually treated in the institution). Patients who, at the time of the interview, exhibited acute alcohol intoxication; cognitive deterioration which, in the patient's therapist's opinion, would preclude conducting the interview; or who declined participation, were excluded. Informed consent was obtained from all participants.

The sample of relatives included all individuals who accompanied the patients participating in the interview on the day it was conducted. The objective was to recruit family members who had a close personal relationship with the dependent, and thereby measure the possible influence of alcohol dependence on the quality of life of persons close to the dependent. If no family members came in on the day of the interview, the family member (if there was one) who usually accompanied him was contacted to be included in the sample. There was no other exclusion criterion other than refusal to participate. Dependents as well as family members were interviewed personally and independently by the first co-author, to address potential problems that might arise during the interview.

The sample from the Galician general population was recruited using a stratified random sampling and final adjustments for gender and age quotas (the size of the sample guarantees a margin of error lower than 5 %). Subjects were excluded if they declined to be interviewed, had a disability that prevented their participation, or were not at home during the inclusion period. The subjects included in the sample were interviewed personally at their homes. The sampling and the interviews were conducted by a survey company that utilized six professional surveyors trained by us in how to implement the questionnaire correctly.

HRQL measurement

The instrument used in this study to measure the HRQL was the SF-6D, which was designed by Brazier and Roberts [35] and Brazier et al. [34] as a modification of the general SF-36 questionnaire [36]. The SF-6D comprises six dimensions (physical functioning, role limitations, social functioning, pain, mental health, and vitality), with the first dimension referring to "a typical day" and the rest of dimensions referring to the "past 4 weeks". Each dimension has between four and six levels, allowing the description of 18,000 possible health states. In our view, there are important advantages in applying the SF-6D. First, the SF-6D scores were obtained from the standard gamble valuation procedure, which allows introducing attitudes about risk into the valuation. It is argued that "because future health outcomes are clearly uncertain in the real world, the preferences measured under uncertainty are more appropriate" [14]. Second, the SF-6D does not appear to have the ceiling effect that characterizes the EQ-5D and makes it difficult for the EQ-5D to discriminate between health states close to good health [37]. Finally, an algorithm designed by Brazier et al. [34] allows one to transform the SF-36 items into SF-6D items, and then into utility scores. This is an important advantage, because we use this algorithm to transform the SF-36 (version 2) items obtained from alcoholic and family member samples into SF-6D items.

There is evidence, however, that the SF-6D has a floor effect; that is, this instrument is insensitive when trying to discriminate between very bad health states [38]. This causes SF-6D utilities to have a minimum value that is considerably higher than the minimum obtained with other instruments, suggesting an overestimation of poor states of health. For example, while the EQ-5D has negative values, indicating the existence of states worse than death, the SF-6D as assessed by Brazier et al. [35] has a minimum value of 0.30. Although part of this insensitivity may be due to the instrument's descriptive system, some studies [39] show that it may also be due to the valuation method (standard gamble) utilized.

To mitigate the floor effect, Abellán et al. [40] proposed the use of the lottery equivalent method [41] to derive SF-6D utilities. In contrast with the standard gamble method, in which the person interviewed is forced to choose between a safe option (e.g., to have a given health state for 30 years) and an option with risk (e.g., a surgical intervention with a 95 % success rate and 5 % risk of death), the lottery equivalent method requires choosing between options with risk. As a result of this methodological change, Abellán et al. obtain a minimum value of −0.357, which would suggest that a large part of the floor effect comes from the valuation instrument. In this study, we applied the utilities estimated by Abellán et al. to obtain the HRQL of the three samples analyzed, for three reasons: 1) the method reduces the floor effect found in other SF-6D tariffs; 2) the utilities were obtained using preferences of the Spanish population, where our sample originated; and 3) they were obtained recently. The SF-6D questionnaire was applied to the general population sample directly and to the alcoholic and family member samples via the SF-36. The persons interviewed also provide information on their sociodemographic characteristics: age, sex, education, type of cohabitation, employment status, and income level. In addition, in the sample of alcoholic persons, we know the date in which the treatment started, as well as the level of consumption (measured in standard drink units), in a normal day, at that date.

Statistical analysis

To estimate the mean impact that alcohol dependence has on HRQL, the utility scores were obtained for the alcoholics, for their family members, and for the general population. Accordingly, the utility range goes from one (good health) to −0.357 (worst level on all dimensions), where zero corresponds to a death equivalent state. The impact of alcohol dependence was analyzed in different ways. Firstly, the mean and median utility values were obtained for each sample. To analyze the impact of alcohol dependence across EQ-5D dimensions, the mean utility loss in each dimension was also obtained. Next, a Tobit regression was estimated to minimize other effects when explaining the correlation between dependence and HRQL. The dependent variable was the utility obtained with the SF-6D and the explanatory variables were the sample to which the interviewee belonged and the interviewee's sociodemographic characteristics. We decided to use the Tobit regression because an important number of respondents are likely to report no problems in any of the SF-6D dimensions, and then common statistical methods as linear regression produce biased estimates [42]. Finally, logistic regressions (adjusted by sociodemographic characteristics) were performed to analyze the impact of alcoholic dependence on the probability of having a problem (none vs. some) in any of the SF-6D dimensions.

Results

Sample descriptions

During the recruitment period, a total of 161 patients came in for consultation. Two subjects were excluded for being alcohol intoxicated and eight for cognitive deterioration that would have prevented or hindered understanding the

questionnaire. Only one subject who met the inclusion requirements declined participation in the interview. In only 65 cases, a family member was involved in the treatment, one of whom refused to participate. Of the participants from general population correctly selected (personally or by means of a relative), 11 % could not be finally contacted and 5 % rejected to conduct the interview.

Table 1 describes the three samples analyzed. Compared with the sample of general population, the sample of alcoholics has a higher percentage of males, unemployed persons, subjects who are not living with a partner (less than 50 % were cohabiting) and subjects with a low income level. The majority of dependents present a harmful consumption level (more than 8 units/day for men or more than 6 units/day for women) at the beginning of treatment (56 % began the treatment during the year before the interview). The characteristics of the sample of alcoholics were quite similar to the data provided by the institution (relating to all subjects who came into the alcoholism unit during 2010) with regard to sex (72 % males), average age (44 years old), employment status (33.7 % unemployed), living arrangement (53.2 % living with a partner), and educational level (4 % with no education, 50 % with elementary school education, 27 % with secondary school education, and 11 % with college education). The general population sample also has characteristics similar to those of the Galician population in terms of age, sex, and employment status, although with slightly lower levels of education and income. Finally, the sample of dependent family members is made up predominantly of women, mainly dependent wives.

The SF-6D reduces the ceiling effect that characterizes the EQ-5D. The percentage with good health (SF-6D = 1) is 20.55 % in the general population sample, 3.13 % in the family sample and 2.70 % in the sample of alcoholics. The existence of a floor effect is rejected. Nobody is in the worst state (SF-6D = −0.357) and the percentage of people in the worst level is smaller than 6 % in all dimensions, except mental health and vitality, in both family and alcoholic sample, and role limitations, in the alcoholic sample, whose percentage is between 14 % and 18 %.

Mean and median utility scores

Table 2 shows the mean and median utility scores derived from the SF-6D for each of the samples. The mean utility for the sample of alcoholics is 0.663. Additional tests show that there are not a significant difference between alcoholic females and males (0.663 and 0.674, respectively); however, both the level of consumption and the duration of treatment are related to the utility score. Patients with harmful consumption level at the beginning of the treatment present less quality of life than the rest of patients (0.64 and 0.71, respectively; $p < 0.1$). With regard to the effect of duration of the treatment, those patients with more than 1 year in treatment have a utility score smaller than those with less than 1 year (0.62 and 0.7, respectively; $p < 0.05$). However, there are no significant differences for the remaining intervals within these two groups. These results can be explained because those patients with longer duration of treatment present a more severe pathology, also having higher consumption levels at the beginning of treatment.

The mean utility for the family members sample is 0.724. The mean utility scores for alcoholics and for family members of alcoholics are both significantly different ($p < 0.01$) from the mean utility for the general population, which is equal to 0.807. This analysis indicates that the estimated annual mean loss of QALYs associated with alcohol dependence is 0.144 for the alcoholics and 0.083 for close family members. The analysis of the median also supports these results, although the differences between the general population and the other samples are greater. Compared to the general population, the annual median loss of QALYs for alcoholics is 0.165 QALYs, whereas the corresponding reduction for family members is 0.116 QALYs. In addition, while 75 % of the general population has a utility score greater than 0.75, the corresponding 75 % cutoff score for the alcohol-dependent population is 0.58 (and only 60 % of the alcohol-dependent population have a score greater than 0.75).

The reduction in the mean utility score associated with each of the SF-6D dimensions is reported in Table 2. Compared to the general population, the alcoholics have a significant loss of utility in all dimensions, except in physical functioning and pain. In the family sample, the most affected dimensions are mental health and vitality, and physical function has a positive impact compared to general population.

Effects of other factors on HRQL

Table 3 shows the results of the Tobit regression estimated to control for socioeconomic variables. The impact of being an alcoholic on the utility score is slightly higher after controlling for these variables. Consequently, alcohol dependence is associated with a mean annual loss of 0.162 QALYs for alcohol dependents and of 0.090 for their close family members. As commonly found in the literature, age and being a woman are negatively correlated with health, while education and living with a partner are positively correlated. In preliminary regressions, household income was introduced as a variable, but its effect was not significant, perhaps because part of its potential effect was already captured by the education variable. We decided to not include this variable in the final regression, because

Table 1 Sample descriptions

	Alcohol dependents sample ($n = 150$)	Dependent's family members sample ($n = 64$)	General population sample ($n = 600$)	General Population (official data)
Sex (% males)	69.3	18.8	47.83	48.4[a]
Age distribution (%)				
18–29 years old	5.3	6.3	14.67	12.5[a]
30–44 years old	30.0	29.7	28.00	23.7[a]
45–59 years old	48.7	39.1	23.83	20.8[a]
60–74 years old	15.3	20.3	20.00	16.4[a]
75 years old and older	0.7	4.7	13.50	12.5[a]
Living with a partner (%)	46.7	84.4	69.83	–
Employment status (%)				
Employed	40.0	46.9	42.33	45.6[b]
Unemployed	35.3	28.1	12.17	9.6[b]
Unemployable population	24.7	25.0	45.50	44.8[b]
Retired/receiving pension	20.7	17.2	27.83	28.6[b]
Other situation	4.0	7.8	17.67	16.2[b]
Education level (%)				
Less than primary	10.7	10.9	11.35	1.5[b]
Primary	56.7	59.4	37.33	30.0[b]
Secondary	25.3	15.6	32.67	45.5[b]
University	7.3	14.1	18.67	23.1[b]
Household income distribution (€ per month)				
Less than 1000	42.8	14.3	23.2	24.4[c]
1000–1500	24.8	25.4	30.4	20.9[c]
1500–2000	14.5	30.2	22.1	17.5[c]
2000–3000	15.2	20.6	18.1	22.4[c]
3000–4000	1.4	6.4	4.4	9.0[c]
More than 4000	1.4	3.2	1.9	6.1[c]
Good Health (SF-6D = 1) (%)	2.7	3.1	20.6	
Alcohol intake (%)				
≤4 units/day (men) or ≤3 units/day (women)	12.0			
>4 and ≤8 (men) or >3 and ≤6 (women)	18.7			
>8 units/day (men) or >6 (women)	69.3			
Duration of treatment(%)				
<4 months	22.7			
4–6 months	16.0			
7–12 months	17.3			
1–2 years	22.0			
>2 years	22.0			
Relationship with dependent (%)				
Spouse		67.7		
Son/daughter		4.6		
Sibling		10.8		
Parents		12.3		
Others		4.6		

[a] Census record (2011)

[b] Active population survey (2011). Office for National Statistics

[c] Living Conditions of Galician families survey (2011). Galician institute of statistics

Table 2 Utility scores derived from SF-6D

	Utility score			Mean loss of utility across dimensions (SD)					
	N	Mean (SD)	Median (percentile 25; 75)	Physical functioning	Role limitations	Social functioning	Pain	Mental health	Vitality
General population	600	0.807 (0.159)	0.874 (0.750; 0.940)	−0.017 (0.036)	−0.009 (0.017)	−0.023 (0.048)	−0.035 0.071	−0.043 0.040	−0.065 0.057
Family of alcoholic	64	0.724** (0.213)	0.758 (0.626; 0.868)	−0.009* (0.015)	−0.011 (0.020)	−0.016 (0.051)	−0.050 0.082	−0.083** 0.068	−0.105** 0.068
Alcoholics	150	0.663** (0.211)	0.709 (0.576; 0.801)	−0.013 (0.023)	−0.023** (0.026)	−0.045** (0.069)	−0.046 0.085	−0.089** 0.064	−0.121** 0.056

The tariffs used are those of Abellán et al. [40]

**(*) Significant at the 1 % level (10 %) compared with the mean of the general population

Table 3 Effect of alcohol dependence on HRQL when controlling for socioeconomic variables

	Tobit model	Adjusted odds of experiencing problems (none vs. some) across SF-6D dimensions					
		Physical functioning	Role limitations	Social functioning	Pain	Mental health	Vitality
Sample (ref. general population)							
Family members	−0.090***	0.473**	0.872	0.205***	3.779***	2.401***	1.430
Alcoholics	−0.162***	0.854	2.619***	1.617**	1.703**	4.438***	5.246***
Age	−0.003***	1.049***	1.014*	1.018***	1.026***	1.000	1.430*
Sex (ref. men)	−0.047***	1.210	1.326	1.526**	1.165	1.747***	5.246
Education level (ref. less primary)							
Primary	0.189***	0.472**	0.291***	0.355***	0.358***	0.359***	0.492**
Secondary	0.271***	0.149***	0.101***	0.149***	0.144***	0.206***	0.367***
University	0.253***	0.093***	0.083***	0.120***	0.075***	0.201***	0.420**
Living with a partner (ref. no)	0.062***	0.768	0.897	0.683**	0.916	0.877	0.930
Labor status (ref. Employed)							
Retired/receiving pension	0.004	1.530	0.978	0.564**	1.104	1.038	0.773
Unemployed	−0.006	1.105	0.944	0.862	0.919	0.973	1.030
Other situations	−0.009	1.119	0.853	0.659	1.027	1.020	1.101
Constant	0.810***						
Pseudo R^2	0.865						
Mean squared error	0.350						
Mean absolute error	0.138						

Observations: 814

* Significant at the 10 %

** Significant at the 5 % level

*** Significant at the 1 % level

12 % of those interviewed in the general population and 3 % of the alcohol dependents and family members did not provide that information, forcing a considerable number of observations to be lost from the estimation.

Table 3 also shows the results of the logistic regressions estimated for each dimension. Compared with general population, alcohol dependents increase odds of reporting problems in all dimensions except physical functioning, which does not present a significant difference. The more affected dimensions are mental health and vitality (the adjusted odds ratio are 4.4 and 5.2, respectively). For the family members, the results are contradictory. Compared with general population, the family members have a higher probability of reporting problems in pain and mental health, but a lower probability of reporting problems in physical functioning and role limitations.

Discussion

The results of this study show that alcohol dependence has a significant impact on the HRQL of afflicted persons. While the mean utility score is 0.807 for the general population, this score is reduced by 0.144 for alcohol dependents (these differences are even higher after controlling for socioeconomic variables). This impact in the HRQL is also relevant in practice. The literature about "minimally important differences" for health states utility (defined as the difference that is perceived by patients as beneficial) suggested that a difference of 0.041 in the case of the SF-6D represents a minimally important difference [43]. The estimated impact is uneven across SF-6D dimensions. Compared to general population, alcoholics have a significant loss of utility in all dimensions, except in physical functioning and pain. These results hold when the effect of alcoholic dependence on the probability of present problems is analyzed, except in the pain dimension, which also has a significant effect.

The loss of HRQL associated with alcohol dependence, which induces a reduction of 17.8 % with respect to the general population, is greater than that obtained in other studies with similar objectives and methodology [28–30]. The differences between our results and those of Petrie et al. [30] are not excessively large. They estimate an 11.7 % reduction in the utility when comparing very-high-risk drinkers with low-risk drinkers without past alcohol problems. However, there are important differences between our results and those of Saarni et al. [28] and Maheswaran et al. [29]. In the Saarni el al. study, a very small difference is found between the mean utility score obtained for pure (EQ-5D = 0.866) or comorbid (EQ-5D = 0.829) alcohol dependence and the score for the general population (EQ-5D = 0.835). However, when socioeconomic variables are controlled for, the utility score associated to alcohol dependence had a negative impact of 0.072 in relation to the general population. In the Maheswaran et al. study, harmful alcohol consumption (in comparison to never drinking) does not have a significant impact on HRQL after adjusting for sociodemographic and health-related confounders (the mean unadjusted utility score is even higher). In both studies, the authors themselves point out that the utility score obtained was low compared to the literature.

We think that at least two types of factors may be causing the differences between our results and those of previously mentioned studies; one related to the sample selection and identification of alcohol dependence and the other related to the measurement instrument and valuation method utilized. For the former, we used different methods to select the sample from the general population and the sample of alcoholics. The first was selected via stratified random sampling of the general population, whereas the second was taken from a population of diagnosed patients (all meeting DSM-IV-TR [44]) who were coming in for treatment at an alcoholism unit. We were strict in the correlative inclusion of patients, applying minimal exclusion criteria (acute alcohol intoxication and cognitive deterioration), with only one refusal to participate in the study. In the study by Petrie et al. [30], utility scores were obtained from a general population sample through an interview conducted by mail (in which subjects with alcohol problems identified themselves) that had a response rate of 38 %. Given the types of questions that were asked regarding alcohol consumption, it is highly likely that the proportion of non-response decreases with the severity of alcohol dependence. In fact, most of those who responded were women and older persons, subpopulations with lower levels of alcohol dependence. This bias of selection can result in an underestimation of the impact of alcohol consumption, as recognized by the authors themselves. In addition, the Alcohol Use Disorder Identification Test (AUDIT) [45] used by Petrie et al. does not allow for an identification of alcohol dependence, but rather, identifies risk levels based on consumption during the last year. Based on the score obtained by the AUDIT, Petri et al. classify the subjects into the following risk categories: abstainer, low risk, medium/high risk and very high risk. To compare their results with ours, we identified alcohol dependence with very high risk, but we cannot rule out the possibility of an unknown percentage of subjects who were very high risk without dependence. This might also explain the higher utility score of alcohol dependence found by Petrie et al. [30]. The same applies to the Maheswaran et al. [29] study. They used a unit/day of consumption to categorize alcohol consumption, harmful drinkers being the category that presents the highest level of consumption. Therefore, alcohol dependence cannot be identified either. Finally, the study of Saarni et al. [28] also has a high rate of non-response (for 35 % of the interviewees, the impact of alcohol dependence could not be calculated by the EQ-5D). Their study uses the Munich-Composite International Diagnostic Interview [46], which allows alcohol dependence to be identified. However, that tool is not utilized in conjunction with clinical criteria; that is, it is not used as a supplementary test in a consultative setting.

The instrument used may also partly explain the differences we find. While we apply the SF-6D, the aforementioned studies use the EQ-5D. The SF-6D identifies a higher number of health states than the EQ-5D (18,000 compared to 243) and does not appear to exhibit the ceiling effect observed for the EQ-5D. Saarni et al. warn against this effect, pointing out that 47 % of their sample exhibits the best possible health state (30 % of those with psychiatric disorders). In our samples, this percentage drops to 20.55 %

for the sample from the general population and to 2.7 % for the sample of alcoholics. This greater measurement sensitivity might partially explain the greater impact of alcohol dependence that we find. Our study also differs from previous studies in the valuation method. As previously pointed out, the Spanish SF-6D tariff used in our study was estimated by the lottery equivalent valuation method rather than the time trade-off method employed with the EQ-5D. Nonetheless, it is difficult to predict to what extent this may affect the differences found. Although the standard gamble often provides higher utility indices than the time trade-off procedure, this is not necessarily true for the lottery equivalent method, since there is evidence that the latter provides lower estimates than the standard gamble [40].

Since the SF-6D utility scores in our study are obtained in a context of risk (a result of using a lottery equivalent method), we also want to compare our results with those obtained by Kraemer et al. [21] in a similar context (where they use the standard gamble). Even though the authors use a very different methodology (the alcohol dependence utility score was obtained via valuation of a hypothetical scenario by a sample of convenience), they derive a utility score (0.67) similar to ours. Finally, the World Health Organization (WHO), using the disability adjusted life year (DALY), estimated that the disability weight to both alcohol dependence and harmful consumption was 0.18 (on a scale from 0-perfect health to 1-death) [19]. This impact is smaller than our estimation, because they estimate this weight in relation to perfect health and our values are estimated in relation to the score utility from general population. This difference can be explained by the different methodology used (the weight was obtained from an expert group and not from society preferences, using the person trade-off method), and by the non-separation between the effects of alcohol dependence and harmful consumption without dependence.

Our study also estimates the impact of alcohol dependence on the HRQL of family members. As demonstrated recently by Nutt et al. [32] in a study conducted with drug addiction experts, while heroin, crack, and methamphetamine are the drugs that cause the most harm to abusers, alcohol is the drug that does the most harm to the persons around them. However, in the literature review conducted, we find no study using utility scores that quantify the effects on the quality of life of persons close to the dependent. In contrast, we find that the family members of alcoholics, when compared to the general population, suffer a mean annual loss of 0.08 QALYs, which rises to 0.09 when controlling for socioeconomic variables. The effects on mental health and vitality are the main contributors to this loss of utility. These results, although significant, must be considered cautiously, however, in view of the small size of our sample of family members.

The results presented in this work may be affected by several limitations. First, using a sample of alcoholics not taken from the general population potentially involves a selection bias. It is possible that patients going to the same alcoholism treatment unit would have a quality of life different from a sample of alcoholics taken at random from the general population. However, we have no evidence of any such bias, or if so, about its direction. It is possible, on the one hand, that the patients in our sample have particularly severe symptoms that brought them to seek treatment for their alcohol dependence. However, it is also likely that those with the most severe clinical pictures of dependence, linked in many cases to situations of social exclusion, do not come in for treatment, since they are unwilling to do so. In any case, we consider a correct identification of alcohol dependence to be the key to our study and although our recruitment method does not guarantee random recruitment of the alcohol-dependent population (only random recruitment from a population under treatment), it does guarantee that all those recruited are alcohol dependent, diagnosed as such by a specialist. Second, the small size of the family member sample limits our study, and we do not know to what extent this may bias the utility indices derived from that sample.

It is difficult to know to what extent our analysis is controlling for all the relevant variables. We take into account the socioeconomic variables most commonly utilized in the literature, but in contrast to Saarni et al. [28], we do not control for other somatic and psychiatric comorbidities, because this information was not collected. Regardless, in our view, the appropriateness of controlling for somatic comorbidities is not clear, since some of them may be a consequence of alcoholism, and consequently should not be eliminated to measure their overall effect. This is the case for disorders such as neoplasms, cardiomyopathy, hypertension, stroke, and diabetes. It is more evident even with psychiatric disorders, disorders that appear with rather high frequency due to the alcohol dependence. In any case, in the study of Saarni et al., the impact of the alcohol dependence in the utility scores is barely modified after controlling for somatic and psychiatric comorbidities. Finally, we do not consider the consumption of other illicit drugs (this information was not collected), which could lead to overestimation of the impact of alcohol dependence.

Another relevant limitation of this paper is its failure to address issues of endogeneity, mainly in the alcoholic sample. The relation between alcohol problems and a poor quality of life may be explained in at least two different ways. First, it could be argued that both variables can be partially caused by a common risk factor (poor mental health, low past income, previous unemployment, problems during childhood, etc.), not adequately controlled for

in the regression. Although past economic problems can be at least partially controlled by using education, we do not have information about poor mental health or problems during childhood; therefore, a part of the relation found can be accounted for by common confounding factors. Second, reverse causality (alcohol increases the risk of poor quality of life, but poor quality of life can, in turn, increase the risk of alcohol) can bias the estimations. Unfortunately, our estimations are limited by the data available. We do not have longitudinal data or an adequate instrumental variable to check for endogeneity. Recently, some studies concerning the effects of alcohol have addressed issues of endogeneity in a different context. Fergunson et al. [47] analyzed the relationship between alcohol dependence and depression using a fixed-effects model to control for confounding factors, and a structural model with longitudinal data to ascertain the direction of causality. They concluded that the association between alcohol and depression could not be explained by confounding factors. With regard to the direction of causality, they obtained that this association was better explained by a causal model where problems with alcohol increased the risk of depression. Mentzakis et al. [48] analyzed the relation between alcohol consumption and wellbeing using the method of instrumental variables. They found that increased alcohol consumption decreases wellbeing and that ignoring endogeneity leads to underestimation of this effect. Although the results of these studies support the hypothesis of a causal pathway from alcoholic dependence to quality of life and that controlling for confounding effects does not eliminate the association between both variables, our results must be viewed with caution.

The results of this study have an immediate application in epidemiological studies, as well as economic evaluation. First, they add more detailed information to the simple analysis of alcoholism prevalence, providing information on the loss of quality of life caused by this disease. In order to adopt a conservative perspective, we consider the lowest prevalence estimates for the Spanish population aged between 14 and 65 years, which according to Rehm et al. [49] is 0.2 % for women and 1.2 % for men. Under this scenario, we estimate an annual loss of HRQL associated with alcohol dependence of 31.260 QALYs for this population subgroup. Second, given that we estimate utility scores, our results can be incorporated into the economic evaluation of interventions aimed at reducing or preventing alcohol harms. In any case, to estimate the total loss in QALYs associated with alcohol dependence, the reduction in the utility score should be added up across the duration of alcoholism situation. In addition, the alcohol dependence also reduces the life expectancy (20 years according to a recent study [4]), and therefore, this loss of QALYs should also be added up.

In summary, this study has shown that alcohol dependence has a significant effect on the HRQL of alcohol dependents and their families, and that this impact is also clinically important. The loss of HRQL estimated is higher than that obtained in other studies. Both the instrument used (SF-6D) and mainly the selection method of alcoholic sample (patients diagnosed with alcohol dependence) could explain these results. We consider that future research in this area should depart from paying attention to an adequate identification of alcohol dependence, to avoid the fact that the effects of this severe pathology are not adequately estimated.

Acknowledgments Financial support from the Consellería de Economía e Industria (Xunta de Galicia) grant no. 10SEC300038PR and from the Spanish Ministry of Science and Innovation grant no. ECO2011-25661 is gratefully acknowledged. We are also very grateful to professionals and patients from Alcoholism Care Unit of Vigo for their collaboration in this study.

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