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The association of alcohol use and quality of life in depressed and non-depressed individuals: a cross-sectional general population study

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Abstract

Purpose To compare the associations of alcohol-related variables with Quality of Life (QoL) in depressed and non-depressed individuals of the general population.

Methods This cross-sectional study utilized data from the FINRISK 2007 general population survey. A subsample ($n = 4020$) was invited to participate in an interview concerning alcohol use. Of them, 2215 (1028 men, 1187 women; response rate 55.1%) were included in the analyses. Bivariate associations between mean weekly alcohol consumption, frequency of binge drinking, Alcohol Use Disorders Identification Test (AUDIT)-score and QoL were analysed according to categorization into depressed and non-depressed using the Beck Depression Inventory, Short Form. Linear regression models were calculated in order to determine the associations of the alcohol variables and QoL after adjusting for socio-demographic variables as well as somatic and mental illness.

Results Depressed individuals had lower mean QoL and higher AUDIT-scores than non-depressed respondents. Bivariate correlations showed that mean weekly alcohol consumption, frequency of binge drinking and AUDIT-scores were statistically significantly associated with impaired QoL in depressed individuals. Abstinence was not associated with QoL. After adjustment for covariates, frequency of binge drinking and AUDIT-score were statistically significantly associated with QoL in depressed individuals and AUDIT-score in the non-depressed group. When analysing all respondents regardless of depression, both AUDIT-score and binge drinking were associated with QoL.

Conclusions Of the alcohol-related variables, binge drinking and alcohol problems indicated by AUDIT-score contributed to impaired QoL in depressed individuals and both should be assessed as part of the clinical management of depression.

Keywords Binge drinking · Depression · Quality of life · Heavy drinking · Alcohol problems

Introduction

Quality of life (QoL) reflects the subjective satisfaction and enjoyment with which an individual views his or her daily life and activities. It can encompass functioning in different roles and areas of life, but where measuring functioning is often objective and performance based, the estimation of QoL has to do with subjective life satisfaction [36]. QoL is recognized as a relevant measure in health research.

Depression is among the leading causes of disability globally [35]. Depression has a detrimental effect on QoL and functioning [11, 24]. Impairment of QoL can persist after symptomatic improvement or recovery of depression and even place patients at risk for relapse [2, 19]. It has been demonstrated that decreased QoL predicts depressive symptoms over time [12]. Therefore, understanding the variables contributing to impairment of QoL in the context of

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depression can be important in both treatment and relapse prevention.

High-level alcohol consumption, binge drinking and alcohol dependence have been shown to impair QoL [10, 14, 16, 25]. Donovan et al. [8] reviewed the literature addressing QoL as it is related to drinking behaviour, alcohol use disorders and treatment outcomes. They reported that the relationship between QoL and alcohol dependence was moderated by a number of socio-demographic variables and comorbidities, including age, education, gender and co-occurring psychiatric disorders. Daeppen et al. [6] concluded that QoL in alcohol-dependent patients is subject to drinking patterns.

A diagnosis of depression or symptoms thereof has been associated with diminished QoL also in alcohol-dependent patients [14]. Despite the fact that alcohol problems commonly co-occur with depression and contribute to worse social functioning than in depression alone [20, 34], to the authors' knowledge, no studies have examined the effect of alcohol-related variables, for example binge drinking, on QoL specifically in depressed individuals.

The aim of this study was to compare the associations of alcohol-related variables (abstinence, mean weekly alcohol consumption, frequency of binge drinking and alcohol problems as measured by the Alcohol Use Disorders Identification Test (AUDIT)-score) with QoL separately in depressed and non-depressed individuals.

Methods

This cross-sectional study utilized data from the general population FINRISK 2007 survey. The FINRISK 2007 was approved by the Coordinating Ethics Committee of the Hospital District of Helsinki and Uusimaa. The FINRISK 2007 comprised a randomly selected sample of 11 953 persons between the ages of 25 and 74 from six regions in Finland. The non-weighted sample was stratified to contain 200 subjects of each sex and 10-year age group (25–34, 35–44, 45–54, 55–64 and 65–74 years of age) from each region [26]. After sampling, 47 individuals died or moved away from the regions resulting in a total sample size of 11,953. The FINRISK 2007 study included several subsamples with different focuses, e.g. nutrition, disability and alcohol use. The present study analysed data from a random subsample (4020 subjects; 67% of the original sample from three regions), for which alcohol use was investigated in detail.

All subjects in the FINRISK 2007 survey received a questionnaire by mail that included questions regarding socio-demographic information, general health habits, chronic diseases and symptoms. The alcohol subsample received, in addition, an invitation to a health check during which the subjects filled out the Alcohol Use Disorders Identification Test (AUDIT) and the Beck Depression Inventory, Short Form (BDI-SF), and were also asked to participate in the Timeline Follow-back (TLFB) interview.

Of the 4020 subjects invited, 2646 (1229 men, 1417 women) attended the health check. Of these, all necessary data were available for 2215 subjects (1028 men, 1187 women), yielding a total response rate of 55.1%. Missing data were largely due to incomplete BDI-SF submissions.

The TLFB was used to evaluate subjects' alcohol consumption. The TLFB is a daily drinking estimation measure based on retrospective self-report. It is a recommended instrument for measuring alcohol consumption in large study populations [32]. The timeframe for the TLFB can vary. In an evaluation of large study samples, the TLFB with a 1-month window was found to be representative of annual consumption [37]. In the FINRISK 2007 study, the TLFB was administered in an interview setting by trained research assistants. The assistants reviewed day-by-day the previous 28 days using key events of life to help subjects in recalling frequency and amounts of any alcoholic beverages consumed as precisely as possible. The interviewer converted the reported amounts into units of Finnish standard drinks equivalent to approximately 12 g of absolute alcohol (e.g. 33 cl bottle of beer, 12 cl glass of wine or 4 cl of spirits).

Mean weekly alcohol consumption and binge drinking were calculated from the TLFB, and abstinent subjects were included in reported means. The definition of binge drinking was chosen in accordance with the Finnish guidelines [40]. For men, binge drinking was defined as seven or more standard drinks on one drinking occasion, while the respective number of drinks for women was five. Mean weekly alcohol consumption and frequency of binge drinking were used in the analyses as continuous variables. Abstinence was defined as consuming no alcohol at all during the past 28 days as reported in the TLFB.

Alcohol problems were measured by AUDIT-score. The AUDIT is composed of ten questions [31]. Each question is scored zero to four, yielding a maximum of 40 points. The first three questions evaluate drinking frequency, average quantities consumed on drinking occasions and the frequency of occasions on which the amount consumed exceeded six drinks. The AUDIT also proceeds to evaluate alcohol problems, i.e. symptoms of harmful use and dependence via questions regarding problems in control over drinking, loss of social and/or vocational functioning due to alcohol, feelings of guilt, use of "eye-openers" (i.e. does one need a drink in the morning to get going) and possible physical harm to oneself or others due to drinking. The final question is aimed at assessing concern by family, friends or medical personnel for one's alcohol use. A score of eight or more points indicates alcohol problems, and the higher the score, the higher the probability of alcohol problems [1, 29].

Internal consistency for the AUDIT was good (Cronbach's alpha = 0.809).

Quality of life was measured with the following single-item question: "Next we would ask You to evaluate how good You feel Your life is as a whole, i.e. Your quality of life in the past month (30 days). Please rate Your quality of life by circling the number which best reflects Your quality of life. Zero reflects the worst possible quality of life and ten the best". Single-item measures of global QoL have been found to have good validity and reliability [7] and are usable in large population surveys.

Depression was measured by a slightly modified version of the BDI-SF [15]. The BDI-SF is a simplified shorter version of the original BDI and has been found to be an adequate alternative to the original BDI for depression screening [3, 4]. It is composed of 13 items (questions 1, 2, 3, 4, 5, 7, 9, 12, 13, 14, 15, 17 and 18 of the original 21-question BDI). Beck et al. [4] defined a cut-off of eight or more points on the BDI-SF as indicative of depression, which is the cut-off that was used in this study. Internal consistency for the BDI-SF was good (Cronbach's alpha = 0.852).

Marital status and education have been associated with decreased QoL in depression [5]. In this study, lower education was classified as 12 years or under, corresponding to the 9 years of basic primary education mandatory for all children in Finland and a maximum 3 years of vocational or high school studies. Higher education was defined as 13 years or more, corresponding to college and/or university studies. Subjects were categorized into being married or cohabiting versus being single, divorced or widowed.

Psychiatric comorbidities have widely been reported to diminish QoL (e.g. Linzer et al. [17]). Berlim et al. [5] also reported psychiatric comorbidities as an independent variable contributing to QoL impairment in depressed individuals. In this study, subjects were asked to report if they suffered from other mental disorders than depression.

Chronic diseases have been associated with impaired QoL [33]. In this study, a subject was classified as having somatic illness if he/she reported at least one of the following illnesses requiring treatment by a physician in the past 12 months: myocardial infarction, angina pectoris, chronic heart failure, elevated blood pressure, stroke, cancerous malignancies, chronic asthma, emphysema, chronic bronchitis, rheumatoid arthritis, other articular diseases, chronic back pain, chronic urinary tract infection or nephritis.

Statistical analyses

All analyses were performed with SPSS version 22. Descriptive statistics (Fischer's exact test, *t* test) were used for characterization of the study population and studying the differences between depressed and non-depressed groups.

The bivariate associations of socio-demographic variables, somatic and mental illness other than depression, mean weekly alcohol consumption, AUDIT-score, frequency of binge drinking and abstinence with QoL were analysed using Pearson correlations for continuous variables and *t* tests for categorical variables. Continuous variables were age, mean weekly alcohol consumption, AUDIT-score and frequency of binge drinking. Other variables were categorical. *T* test and Pearson correlations were calculated separately for all subjects and subjects categorized as depressed or non-depressed according to the defined BDI-SF cut-off score of 8. Results were considered statistically significant at $p < 0.05$.

Linear regression models were created for all, depressed and non-depressed respondents. First, the covariates (gender, age, marital status, years of education, somatic and mental illnesses) were entered into the model. Then, all alcohol variables were entered one by one in order to determine whether they were associated with QoL after adjustment for the background variables. The associations of the alcohol variables and QoL were analysed independently due to collinearity (Table 1). Change in adjusted R^2 was evaluated to determine whether the alcohol variables had additional value in explaining the percentage of variability in QoL by the model.

Table 1 Collinearity of alcohol variables

	Frequency of binge drinking[a]		Mean weekly alcohol consumption		AUDIT-score		Abstinence	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Frequency of binge drinking	1	–	–	–	–	–	–	–
Mean weekly alcohol consumption	*0.864*	*< 0.001*	1	–	–	–	–	–
AUDIT-score	*0.577*	*< 0.001*	*0.651*	*< 0.001*	1	–	–	–
Abstinence	–	*< 0.001*	–	*< 0.001*	–	*< 0.001*	1	–

Statistically significant findings are reported in italic

Pearson correlations for continuous and *t* test for categorical variables

[a]Frequency of consuming ≥ 7 (men) or ≥ 5 (women) standard drinks equivalent to 12 g of alcohol on one drinking occasion in past 28 days, abstinent subjects included

Listwise deletion was applied due to the assumption that data were missing completely at random (MCAR). However, because the assumption of data MCAR is difficult to determine, the final analyses were also performed using multiple imputation to account for missing data in order to ascertain that listwise deletion did not bias the main results. After screening the data and determining that data were missing in an arbitrary pattern, multiple imputation was performed with the chained equation method, specifically the iterative MCMC algorithm which is the default for arbitrarily missing data in SPSS. The five imputed datasets with a maximum of ten iterations were pooled for analyses. Imputation was performed if missing data were observed for all confounding and alcohol variables, the dependent variable (QoL) as well as the variable according to which the results were stratified (depression measured with the BDI-SF). The percentages of missing data were as follows: BDI-SF 16.3%, abstinence 9.9%, mean weekly alcohol consumption 9.2%, AUDIT-score 8.0%, QoL 3.4%, somatic illness 2.0%, psychiatric illness other than depression 1.0%, years of education 1.0%, gender, age and binge drinking 0.0%.

Results

Characteristics and bivariate associations

Characteristics of all, depressed and non-depressed individuals and differences between the depressed and non-depressed groups are presented in Table 2. Mean QoL was statistically significantly lower in depressed than in non-depressed individuals. Depressed subjects had higher AUDIT-scores and were abstinent more often than non-depressed individuals. Mean weekly alcohol consumption was moderate in all groups as indicated by the mean number of units consumed per week 4.07–4.64 (SD 6.08–6.71); however, the range of mean weekly alcohol consumption was wide, from 0 to 75 units. Subjects had engaged in binge drinking from a mean 1.37 to 1.64 times during the previous 28 days. The frequency of binge drinking also varied markedly from no binge drinking to daily binge drinking during the previous 28 days. Frequency of binge drinking and mean weekly alcohol consumption did not differ significantly between the depressed and non-depressed groups.

Bivariate associations of QoL with the background and alcohol variables are presented in Table 3. When analysing all subjects, all variables except abstinence were significantly associated with QoL. Being single, divorced or widowed and being less educated as well as having a higher AUDIT-score were all associated with impaired QoL regardless of depression classification. Of the alcohol-related variables, in depressed individuals, binge drinking more frequently, a higher AUDIT-score and higher mean weekly alcohol consumption were all statistically significantly associated with impaired QoL. In non-depressed individuals, having a higher AUDIT-score was associated with impaired QoL. Abstinence was not associated with QoL in any group.

Multivariate regression analyses: original data

Separate linear regression models were created for all respondents and the depressed and non-depressed groups (Table 4).

In depressed individuals, only frequency of binge drinking was associated with QoL after adjusting for covariates. The percentage of variability of QoL explained by the models (adjusted R^2) increased from 0.032 (covariates only) to 0.042 (covariates + frequency of binge drinking). In non-depressed individuals, AUDIT-score was statistically significantly associated with QoL after adjusting for covariates. However, the increase in the percentage of variability of QoL was modest (from 0.054 to 0.057).

When analysing all subjects regardless of depression classification, both AUDIT-score and binge drinking—when analysed independently of each other—were statistically significantly associated with QoL after adjusting for covariates. The AUDIT provided a larger increase in the percentage of variability of QoL explained by the models (0.069 to 0.083) than did binge drinking (from 0.069 to 0.070).

Multivariate regression analyses: imputed data

When analysing pooled data after multiple imputation to account for missing data, AUDIT-score and frequency of binge drinking were both associated with QoL after adjusting for covariates in depressed individuals (Table 4). No significant changes in the associations of the alcohol variables were observed when analysing all subjects or the non-depressed group.

Discussion

This cross-sectional study aimed to compare the effect of abstinence, mean weekly alcohol consumption, frequency of binge drinking and alcohol problems measured with AUDIT-scores on QoL in depressed and non-depressed individuals of the general population. Frequency of binge drinking and alcohol problems measured with AUDIT-score were associated with decreased QoL in the depressed subgroup after adjusting for covariates. In non-depressed respondents, AUDIT-score contributed to decreased QoL. When analysing all respondents irrespective of depression categorization, both AUDIT-scores and binge drinking were associated with QoL. Of these two alcohol variables, AUDIT-scores had a larger impact on QoL in the general population.

Table 2 Characteristics and differences between non-depressed and depressed groups

	All subjects $n=2215$	Non-depressed[a] $n=1871$	Depressed[a] $n=344$	p
Women (%)	54.7	53.3	62.5	*0.002*
Age, years				*0.965*
Mean (SD)	50.7 (13.9)	50.7 (13.9)	50.7 (13.8)	
Median (IQR)	52.0 (24.0)	52.0 (24.0)	53.0 (23.0)	
Range	25–74	25–74	25–74	
Single, divorced or widow (%)	28.9	27.4	39.0	*< 0.001*
Years of education ≤ 12 (%)	47.3	46.3	54.0	*0.009*
Somatic illness[b] (%)	43.6	41.8	53.5	*< 0.001*
Mental illness, other than depression (%)	2.3	1.5	6.7	*< 0.001*
Quality of life[c]				*< 0.001*
Mean (SD)	7.49 (1.50)	7.83 (1.19)	6.26 (1.70)	
Median (IQR)	8.00 (1)	8.00 (2)	7.00 (2)	
Range	0–10	0–10	1–9	
BDI-SF-score				*< 0.001*
Mean (SD)	3.71 (4.57)	2.09 (2.10)	12.6 (4.19)	
Median (IQR)	2.00 (5.00)	1.00 (4)	12.0 (2.00)	
Range	0–32	0–7	8–32	
Frequency of binge drinking[d]				0.274
Mean (SD)	1.45 (3.04)	1.41 (2.90)	1.65 (3.74)	
Median (IQR)	0.00 (2.00)	0.00 (2.00)	0.00 (2.00)	
Range	0–28	0–28	0–27	
Mean weekly alcohol consumption				0.366
Mean (SD)	4.21 (6.07)	4.18 (5.81)	4.64 (7.81)	
Median (IQR)	2.00 (5.38)	2.00 (5.30)	1.75 (5.88)	
Range	0–66	0–66	0–63	
AUDIT-score				*< 0.001*
Mean (SD)	5.23 (4.47)	5.05 (4.12)	6.22 (5.93)	
Median (IQR)	4.00 (5.00)	4.00 (5.00)	4.00 (6.00)	
Range	0–37	0–26	0–37	
Abstinent (%)	18.4	17.4	23.8	*0.008*

Statistically significant findings are reported in italic

[a]Depressed (Beck Depression Inventory, Short Form-score ≥ 8) and non-depressed (< 8) subjects

[b]One or more of the following in past year: myocardial infarction, angina pectoris, chronic heart failure, elevated blood pressure, stroke, cancerous malignancies, chronic asthma, emphysema, chronic bronchitis, rheumatoid arthritis, other articular diseases, chronic back pain, chronic urinary tract infection, nephritis

[c]Self-report, scale 0–10 with 0 lowest, 10 highest

[d]Frequency of consuming ≥ 7 (men) or ≥ 5 (women) standard drinks equivalent to 12 g of alcohol on one drinking occasion in past 28 days, abstinent subjects included

To the authors' knowledge, previous studies have not examined the effect of binge drinking on QoL in depressed individuals. In the entire general population, previous studies have shown that frequent binge drinking has a negative impact on QoL [18, 21–23, 25, 38, 39]. The results of the present study are in concordance with these findings in the general population. However, the present results also indicate that the effect of binge drinking on QoL may be different in specific groups, e.g. individuals with depression. In this study, more frequent binge drinking had a negative impact on QoL in depressed individuals but was not significant in the case of non-depressed respondents.

The negative impact of alcohol dependence on QoL is well established in the literature [14, 28]. In the present study, higher AUDIT-scores predicted impaired QoL in all subjects irrespective of depression. Higher AUDIT-scores can be indicative of alcohol dependence, and thus the results of the present study are in concordance with previous literature.

Table 3 Associations of categorical and continuous (cont.) variables with quality of life

	All subjects $n=2215$			Non-depressed[a] $n=1871$			Depressed[a] $n=344$		
	Mean (SD)	*r*	*p*	Mean (SD)	*r*	*p*	Mean (SD)	*r*	*p*
Gender									
Male	7.41 (1.564)	–	*0.009*	7.75 (1.204)	–	*0.011*	6.04 (1.868)	–	0.065
Female	7.57 (1.441)			7.89 (1.178)			6.39 (1.574)		
Age, years (cont.)	–	−0.054	*0.006*	–	−0.054	*0.022*	–	−0.038	0.487
Marital status									
Married/cohabiting	7.65 (1.435)	–	*<0.001*	7.95 (1.126)	–	*<0.001*	6.43 (1.709)	–	*0.024*
Single/divorced/widow	7.12 (1.589)			7.50 (1.303)			6.00 (1.647)		
Years of education									
> 13	7.65 (1.373)	–	*<0.001*	7.93 (1.085)	–	*<0.001*	6.49 (1.676)	–	*0.024*
≤ 12	7.34 (1.606)			7.71 (1.285)			6.07 (1.695)		
Somatic illness[b]									
No	7.71 (1.324)	–	*<0.001*	7.96 (1.094)	–	*<0.001*	6.44 (1.689)	–	0.074
Yes	7.24 (1.634)			7.65 (1.293)			6.11 (1.686)		
Mental illness[c]									
No	7.52 (1.478)	–	*<0.001*	7.84 (1.190)	–	*0.001*	6.28 (1.688)	–	0.380
Yes	6.38 (1.830)			7.08 (1.129)			5.95 (1.812)		
Frequency of binge drinking[d] (cont.)	–	−0.048	*0.016*	–	−0.009	0.071	–	−0.149	*0.006*
Mean weekly alcohol consumption (cont.)	–	−0.046	*0.027*	–	0.005	0.836	–	−0.110	*0.048*
AUDIT-score (cont.)	–	−0.155	*<0.001*	–	−0.099	*<0.001*	–	−0.134	*0.015*
Abstinent									
No	7.55 (1.437)	–	0.090	7.84 (1.171)	–	0.489	6.29 (1.617)	–	0.943
Yes	7.42 (1.573)			7.79 (1.225)			6.28 (1.842)		

Statistically significant findings are reported in italic

Self-report, scale 0–10 with 0 lowest, 10 highest

[a]Beck Depression Inventory, Short Form-score, depressed ≥ 8 and non-depressed < 8

[b]One or more of the following in past year: myocardial infarction, angina pectoris, chronic heart failure, elevated blood pressure, stroke, cancerous malignancies, chronic asthma, emphysema, chronic bronchitis, rheumatoid arthritis, other articular diseases, chronic back pain, chronic urinary tract infection, nephritis

[c]Self-reported mental illness other than depression

[d]Frequency of consuming ≥ 7 (men) or ≥ 5 (women) standard drinks equivalent to 12 g of alcohol on one drinking occasion in past 28 days

In the present study, mean weekly alcohol consumption was not associated with QoL in any subgroup. This result can probably be understood by examining the mean alcohol consumption of this population. Mean weekly alcohol consumption was moderate (Table 2). 70% of the population consumed on average 0–6 units of alcohol weekly and 80% of the population consumed on average 10 units or less. Thus, the vast majority of these subjects were moderate drinkers and the results of the present study do not contradict the results of previous studies that have found heavy drinking to be associated with impaired QoL [25, 38]. However, previous literature has not taken into account the impact of depression or depressive symptoms of heavy drinkers on QoL when investigating the relationship between heavy drinking and QoL. The relationship between depression or depressive symptoms, alcohol consumption and problems and QoL in heavy drinkers was not possible in this study due to the low number of heavy drinkers. This relationship warrants further investigation in future studies.

Abstinence has previously been shown to be associated with decreased QoL [30]. It has been suggested that lower QoL in abstinent subjects could be explained by the large number of ex-problem drinkers. Based on the present study, this may not be the case: abstinence was not associated with QoL in depressed or non-depressed individuals. However, abstinent respondents did report more depressive symptoms than current drinkers, and depressive symptoms may explain why abstinence has been associated with impaired QoL in previous studies.

Saarni et al. [30] proposed that low socio-economic status was a mediator for lower QoL which they found to be associated with alcohol problems in the Finnish population.

Table 4 Associations of covariates and alcohol variables with QoL in multivariate linear regression models

	Original data $n=2215$				Imputed data $n=2646$		
	Unstandardized coefficient B	95% CI	p	Adjusted R^2	Unstandardized coefficient B	95% CI	p
All subjects							
Block 1							
Gender	0.186	0.071 to 0.300	*0.001*		0.177	0.064 to 0.290	*0.002*
Age, years	0.003	−0.001 to 0.008	0.178		0.003	−0.002 to 0.008	0.266
Marital status	−0.511	−0.636 to (−0.386)	*<0.001*		−0.515	−0.638 to (−0.391)	*<0.001*
Years of education	−0.233	−0.357 to (−0.108)	*<0.001*		−0.214	−0.338 to (−0.091)	*0.001*
Somatic illness[a]	−0.423	−0.547 to (−0.300)	*<0.001*		−0.403	−0.539 to (−0.267)	*<0.001*
Mental illness[b]	−1.032	−1.391 to (−0.674)	*<0.001*		−1.025	−1.383 to (−0.668)	*<0.001*
				0.069			
Block 2a							
Frequency of binge drinking[c]	−0.022	−0.041 to (−0.002)	*0.028*		−0.022	−0.041 to (−0.003)	*0.023*
				0.070			
Block 2b							
Mean weekly alcohol consumption	−0.009	−0.019 to 0.001	0.072		−0.009	−0.019 to 0.001	0.073
				0.068			
Block 2c							
AUDIT-score	−0.044	−0.058 to (−0.031)	*<0.001*		−0.048	−0.062 to (−0.033)	*<0.001*
				0.083			
Block 2d							
Abstinence	0.055	−0.094 to 0.245	0.469		0.062	−0.177 to 0.332	0.578
				0.066			
Non-depressed[d]							
Block 1							
Gender	0.170	0.062 to 0.279	*0.002*		0.196	0.072 to 0.320	*0.002*
Age, years	0.002	−0.003 to 0.006	0.462		0.002	−0.003 to 0.006	0.394
Marital status	−0.442	−0.564 to (−0.320)	*<0.001*		−0.467	−0.599 to (−0.365)	*<0.001*
Years of education	−0.158	−0.276 to (−0.040)	*0.009*		−0.161	−0.299 to (−0.024)	*0.022*
Somatic illness	−0.288	−0.406 to (−0.170)	*<0.001*		−0.317	−0.465 to (−0.168)	*<0.001*
Mental illness	−0.641	−1.089 to (−0.192)	*0.005*		−0.636	-1.122 to (−0.150)	*0.011*
				0.054			
Block 2a							
Frequency of binge drinking	0.003	−0.016 to 0.022	0.755		−0.006	−0.029 to 0.017	0.599
				0.054			
Block 2b							
Mean weekly alcohol consumption	0.006	−0.004 to 0.015	0.246		−0.001	−0.014 to 0.012	0.865
				0.054			
Block 2c							
AUDIT-score	−0.019	−0.034 to (−0.005)	*0.008*		−0.035	−0.059 to (−0.011)	*0.007*
				0.057			
Block 2d							
Abstinence	0.016	−0.127 to 0.159	0.823		0.026	−0.229 to 0.281	0.824
				0.053			
Depressed[d]							
Block 1							
Gender	0.392	0.018 to 0.767	*0.040*		0.288	−0.298 to 0.874	0.298

Table 4 (continued)

	Original data $n=2215$				Imputed data $n=2646$		
	Unstandardized coefficient B	95% CI	p	Adjusted R^2	Unstandardized coefficient B	95% CI	p
Age, years	0.004	−0.011 to 0.019	0.568		−0.002	−0.016 to 0.012	0.798
Marital status	−0.415	−0.788 to (−0.041)	*0.030*		−0.384	−0.741 to (−0.027)	*0.035*
Years of education	−0.383	−0.779 to 0.013	0.058		−0.307	−0.881 to 0.268	0.266
Somatic illness	−0.255	−0.651 to 0.140	0.205		−0.235	−0.701 to 0.231	0.306
Mental illness	−0.386	−1.114 to 0.342	0.297		−0.814	−1.581 to (−0.047)	*0.038*
				0.032			
Block 2a							
Frequency of binge drinking	−0.055	−0.105 to (−0.005)	*0.031*		−0.060	−0.119 to (−0.002)	*0.043*
				0.042			
Block 2b							
Mean weekly alcohol consumption	−0.018	−0.045 to 0.008	0.174		−0.019	−0.044 to 0.006	0.132
				0.032			
Block 2c							
AUDIT-score	−0.025	−0.060 to 0.009	0.150		−0.049	−0.085 to (−0.012)	*0.010*
				0.035			
Block 2d							
Abstinence	−0.049	−0.488 to 0.390	0.827		−0.161	−0.716 to 0.394	0.542
				0.025			

Statistically significant findings are reported in italic

All alcohol variables have been adjusted for gender, age, marital status, years of education and somatic and mental illnesses

Self-report, scale 0–10 with 0 lowest, 10 highest

[a]One or more of the following in past year: myocardial infarction, angina pectoris, chronic heart failure, elevated blood pressure, stroke, cancerous malignancies, chronic asthma, emphysema, chronic bronchitis, rheumatoid arthritis, other articular diseases, chronic back pain, chronic urinary tract infection, nephritis

[b]Self-reported mental illness other than depression

[c]Frequency of consuming ≥ 7 (men) or ≥ 5 (women) standard drinks equivalent to 12 g of alcohol on one drinking occasion in past 28 days

[d]Beck Depression Inventory, Short Form-score, depressed ≥ 8 and non-depressed < 8

Based on the present results, the variables which make up an individual's experience of quality of life are different in depressed versus non-depressed individuals. The variables that have previously been shown to be associated with QoL in the general population, e.g. most socio-demographic and socio-economic variables and somatic illness [9, 13, 33], appeared to be less important in defining QoL in depressed individuals.

Although this cross-sectional design does not yet provide us information on the causality of the present findings, this study had several strengths. First, it utilized a sufficiently large and randomly selected general population sample allowing for better generalizability of the results than would be possible with that of a selected patient population. However, it is plausible that individuals with the most severe psychiatric and alcohol-related problems are underrepresented in a general population study such as this one. A further strength was the use of the Timeline Follow-back for evaluation of alcohol consumption. It has been recommended for use in large study samples because of its greater accuracy compared with traditional quantity–frequency methods and its better usability compared to concurrent recall methods, e.g. day-to-day drinking diaries [32]. Even though the TLFB with a 1-month window has been found to be representative of annual consumption [37], it is obvious that some individuals categorized as abstinent in this study are not long-term abstainers, but are temporarily abstaining due to, e.g., health-related issues or medications. The classification into depressed and non-depressed groups was done using the BDI-SF. While it is an instrument created primarily for screening for depression, it is both widely used in clinical practice and has been extensively studied and found to be valid in recognizing depressive symptomatology. In this study, it appeared to be effective in recognizing depression because 16% were categorized as depressed compared to the 6.5%

prevalence of depressive disorders in the Finnish general population [27].

When treating patients suffering from depression, it is important to recognize excessive alcohol use and QoL. Not only alcohol problems, but also binge drinking appears to be important in the context of depression and QoL.

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References

1. Aalto, M., Alho, H., Halme, J. T., & Seppa, K. (2009). AUDIT and its abbreviated versions in detecting heavy and binge drinking in a general population survey. *Drug and Alcohol Dependence, 103*, 25–29.
2. Angermeyer, M. C., Holzinger, A., Matschinger, H., & Stengler-Wenzke, K. (2002). Depression and quality of life: Results of a follow-up study. *The International Journal of Social Psychiatry, 48*, 189–199.
3. Beck, A. T., & Beck, R. W. (1972). Screening depressed patients in family practice. A rapid technic. *Postgraduate Medicine, 52*, 81–85.
4. Beck, A. T., Rial, W. Y., & Rickels, K. (1974). Short form of depression inventory: Cross-validation. *Psychological Reports, 34*, 1184–1186.
5. Berlim, M. T., McGirr, A., & Fleck, M. P. (2008). Can sociodemographic and clinical variables predict the quality of life of outpatients with major depression? *Psychiatry Research, 160*, 364–371.
6. Daeppen, J. B., Faouzi, M., Sanchez, N., Rahhali, N., Bineau, S., & Bertholet, N. (2014). Quality of life depends on the drinking pattern in alcohol-dependent patients. *Alcohol and Alcoholism, 49*, 457–465.
7. de Boer, A. G., van Lanschot, J. J., Stalmeier, P. F., van Sandick, J. W., Hulscher, J. B., de Haes, J. C., & Sprangers, M. A. (2004). Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation, 13*, 311–320.
8. Donovan, D., Mattson, M. E., Cisler, R. A., Longabaugh, R., & Zweben, A. (2005) Quality of life as an outcome measure in alcoholism treatment research. *Journal of Studies on Alcohol, Supplement 15*, 119–139 (**discussion 92–3**).
9. Evans, S., & Huxley, P. (2002). Studies of quality of life in the general population. *International Review of Psychiatry, 14*, 203–211.
10. Foster, J. H., Powell, J. E., Marshall, E. J., & Peters, T. J. (1999). Quality of life in alcohol-dependent subjects—A review. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation, 8*, 255–261.
11. IsHak, W. W., Greenberg, J. M., Balayan, K., Kapitanski, N., Jeffrey, J., Fathy, H., Fakhry, H., & Rapaport, M. H. (2011). Quality of life: The ultimate outcome measure of interventions in major depressive disorder. *Harvard Review of Psychiatry, 19*, 229–239.
12. Kuehner, C., & Huffziger, S. (2009). Subjective quality of life aspects predict depressive symptoms over time: Results from a three-wave longitudinal study. *Acta Psychiatrica Scandinavica, 120*, 496–499.
13. Layard, R., Clark, A. E., Cornaglia, F., Powdthavee, N., & Vernoit, J. (2014). What predicts a successful life? A life-course model of Well-being. *Economic Journal, 124*, F720–F738.
14. Levola, J., Aalto, M., Holopainen, A., Cieza, A., & Pitkanen, T. (2014). Health-related quality of life in alcohol dependence: A systematic literature review with a specific focus on the role of depression and other psychopathology. *Nordic Journal of Psychiatry, 68*, 369–384.
15. Levola, J., Holopainen, A., & Aalto, M. (2011). Depression and heavy drinking occasions: A cross-sectional general population study. *Addictive Behaviors, 36*, 375–380.
16. Levola, J., Kaskela, T., Holopainen, A., Sabariego, C., Tourunen, J., Cieza, A., & Pitkanen, T. (2014). Psychosocial difficulties in alcohol dependence: A systematic review of activity limitations and participation restrictions. *Disability and Rehabilitation, 36*, 1227–1239.
17. Linzer, M., Spitzer, R., Kroenke, K., Williams, J. B., Hahn, S., Brody, D., & deGruy, F. (1996). Gender, quality of life, and mental disorders in primary care: Results from the PRIME-MD 1000 study. *The American Journal of Medicine, 101*, 526–533.
18. Luquiens, A., Falissard, B., & Aubin, H. J. (2016). Students worry about the impact of alcohol on quality of life: Roles of frequency of binge drinking and drinker self-concept. *Drug and Alcohol Dependence, 167*, 42–48.
19. Markkula, N., Harkanen, T., Nieminen, T., Pena, S., Mattila, A. K., Koskinen, S., Saarni, S. I., & Suvisaari, J (2016). Prognosis of depressive disorders in the general population-results from the longitudinal Finnish Health 2011 Study. *Journal of Affective Disorders, 190*, 687–696.
20. Merikangas, K. R., Mehta, R. L., Molnar, B. E., Walters, E. E., Swendsen, J. D., Aguilar-Gaziola, S., Bijl, R., Borges, G., Caraveo-Anduaga, J. J., DeWit, D. J., Kolody, B., Vega, W. A., Wittchen, H. U., & Kessler, R. C. (1998). Comorbidity of substance use disorders with mood and anxiety disorders: Results of the international consortium in psychiatric epidemiology. *Addictive Behaviors, 23*, 893–907.
21. Mohamed, S., & Ajmal, M. (2015). Multivariate analysis of binge drinking in young adult population: Data analysis of the 2007 survey of lifestyle, Attitude and Nutrition in Ireland. *Psychiatry and Clinical Neurosciences, 69*, 483–488.
22. Monahan, C. J., Bracken-Minor, K. L., McCausland, C. M., McDevitt-Murphy, M. E., & Murphy, J. G. (2012). Health-related quality of life among heavy-drinking college students. *American Journal of Health Behavior, 36*, 289–299.
23. Okoro, C. A., Brewer, R. D., Naimi, T. S., Moriarty, D. G., Giles, W. H., & Mokdad, A. H. (2004). Binge drinking and health-related quality of life: Do popular perceptions match reality? *American Journal of Preventive Medicine, 26*, 230–233.
24. Papakostas, G. I., Petersen, T., Mahal, Y., Mischoulon, D., Nierenberg, A. A., & Fava, M. (2004). Quality of life assessments in major depressive disorder: A review of the literature. *General Hospital Psychiatry, 26*, 13–17.
25. Paul, L. A., Grubaugh, A. L., Frueh, B. C., Ellis, C., & Egede, L. E. (2011). Associations between binge and heavy drinking and health behaviors in a nationally representative sample. *Addictive Behaviors, 36*, 1240–1245.
26. Peltonen, M., Harald, K., Männistö, S., Saarikoski, L., Peltomäki, P., Lund, L., Sundvall, J., Juolevi, A., Laatikainen, T., Aldén-Nieminen, H., Luoto, R., Jousilahti, P., Salomaa, V., Taimi, M., & Vartiainen, E. (2008) The National FINRISK 2007 Study. Implementation and Results. *Publications of the National Public Health Institute [Kansanterveyslaitoksen julkaisuja]* B34.
27. Pirkola, S. P., Isometsa, E., Suvisaari, J., Aro, H., Joukamaa, M., Poikolainen, K., Koskinen, S., Aromaa, A., & Lonnqvist, J. K. (2005). DSM-IV mood-, anxiety- and alcohol use disorders and their comorbidity in the Finnish general population–results from the Health 2000 Study. *Social Psychiatry and Psychiatric Epidemiology, 40*, 1–10.

28. Pitkänen, T., Levola, J., Tourunen, J., Kaskela, T., & Holopainen, A. (2016) Aivotoiminnan häiriöiden yhteydessä yleisesti koetut psykososiaaliset vaikeudet. *PARADISE24-kyselyn tutkimusperusta*
29. Reinert, D. F., & Allen, J. P. (2007). The alcohol use disorders identification test: An update of research findings. *Alcoholism, Clinical and Experimental Research, 31*, 185–199.
30. Saarni, S. I., Joutsenniemi, K., Koskinen, S., Suvisaari, J., Pirkola, S., Sintonen, H., Poikolainen, K., & Lonnqvist, J. (2008). Alcohol consumption, abstaining, health utility, and quality of life—A general population survey in Finland. *Alcohol and Alcoholism, 43*, 376–386.
31. Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption–II. *Addiction, 88*, 791–804.
32. Sobell, L. C., Sobell, M. B., Leo, G. I., & Cancilla, A. (1988). Reliability of a timeline method: Assessing normal drinkers' reports of recent drinking and a comparative evaluation across several populations. *British Journal of Addiction, 83*, 393–402.
33. Subramaniam, M., Abdin, E., Vaingankar, J. A., Nan, L., Heng, D., McCrone, P., & Chong, S. A. (2013). Impact of psychiatric disorders and chronic physical conditions on health-related quality of life: Singapore Mental Health Study. *Journal of Affective Disorders, 147*, 325–330.
34. Sullivan, L. E., Fiellin, D. A., & O'Connor, P. G. (2005). The prevalence and impact of alcohol problems in major depression: A systematic review. *The American Journal of Medicine, 118*, 330–341.
35. The World Health Organization (2008) *The Global Burden of Disease 2004 update*.
36. The World Health Organization (1995) The World Health Organization Quality of Life assessment (WHOQOL): Position paper from the World Health Organization. *Social Science & Medicine, 41*, 1403–1409.
37. Vakili, S., Sobell, L. C., Sobell, M. B., Simco, E. R., & Agrawal, S. (2008). Using the timeline followback to determine time windows representative of annual alcohol consumption with problem drinkers. *Addictive Behaviors, 33*, 1123–1130.
38. Volk, R. J., Cantor, S. B., Steinbauer, J. R., & Cass, A. R. (1997). Alcohol use disorders, consumption patterns, and health-related quality of life of primary care patients. *Alcoholism, Clinical and Experimental Research, 21*, 899–905.
39. Wen, X. J., Kanny, D., Thompson, W. W., Okoro, C. A., Town, M., & Balluz, L. S. (2012). Binge drinking intensity and health-related quality of life among US adult binge drinkers. *Preventing Chronic Disease, 9*, E86.
40. Working group appointed by the Finnish Medical Society Duodecim and the Finnish Society of Addiction Medicine. (2015) Treatment of alcohol abuse. *Current Care Guidelines*. (**Referred December 16, 2016**).