Title   Are there gender effects in the relation between alcohol consumption and self-assessed health?

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Objectives

The aim of the present study is to compare, for Belgium, in 2001 and 2004, the association linking alcohol consumption (frequency and amount) and self-assessed health for males and females after adjusting for age, education, income, physical and mental health, self-efficacy, social support. We assume that the association will be different between males and females, though this topic has rarely been examined in the literature.

Background

Research examining the relation between a single item assessing self-rated health and mortality conclude that there is a strong association between the two whatever the country, the sex, the age group or other control variables (Idler and Benyamini, 1997; Kawada, 2003; DeSalvo et al., 2005). Subjective health is a good proxy of health status probably because it is a more inclusive and accurate measure of a full array of morbid and pre-morbid conditions (Idler and Benyamini, op. cit.; Mackenbach et al., 2002). As women tend to report higher levels of health complaints than men do (Verbrugge, 1985), they also rate their health worse than men.

While strong epidemiological evidence supports the hypothesis of J-shape relationship between moderate alcohol consumption and coronary heart diseases (Corrao et al., 2000; Rehm et al. 2003), drinking is linked negatively with more than 60 medical conditions (Room et al. 2005). The volume of alcohol consumption but also the type of consumption and particularly heavy irregular drinking or binge drinking, determine the extent of the diseases. In Nordic countries, studies examining the specific associations between alcohol intake and subjective health, conclude that a light to moderate alcohol intake is related to good self-perceived health (Gronbaek, 1999 ; Poikolainen, 1999). On the contrary, a Spanish study (Guallar-Castillon, 2001) found that those who consume higher amounts of alcohol rated their health better than the others.

Research on social inequalities and health generally conclude that those in lower socio-economic groups have higher rates of health risk behaviors or mortality rates than those in higher socioeconomic groups. The specific relation between alcohol consumption and socioeconomic status seems to more complex. Usually in developed countries, a higher prevalence of moderate drinkers is found in higher socioeconomic groups, whereas in lower socioeconomic groups, the prevalence of abstinents is larger, but those who drink are more often heavy drinkers or binge drinkers (Marmot, 1997; van Oers, 1999). In a recent study, Blomfield et al. (2006) emphasized gender differences: in several Western European countries, they found that higher educated women have more often a higher alcohol consumption than the less educated. The relation is exactly the opposite for men.

Both the *Reduction Tension Theory* developed by Conger (1956) and its extension, the *Stress Dampening Theory* proposed by Sher and Levenson (1982), postulate a direct link between growth in stress and increase in alcohol consumption. In most circumstances, alcohol will reduce the level of stress, and people under stress or anticipating stress will consume alcohol to profit from this effect (Sayette, 1999). Today, it is clearly established that drinking and stressful life events are associated (Cooper *et al*. 1992, Sher *et al*. 1997). But the direction of the causal link is still an open question. Under certain circumstances, some people could drink

to cope with stress, but alcohol is itself a stressor (Fourquereau *et al.* 2003). In addition, psychological distress is not the only motivation for drinking.

In Belgium in 2004, 25% of women consider their health as fair to very bad compared to 21% for men, these proportions varying widely according to age-group or educational level. The proportions are relatively stable between 2001 and 2004.

Concerning alcohol consumption, in 2004, 54% of women declared drinking alcohol at least once in a week, and 19% declared at least one episode of heavy binge drinking (six glasses or more) during the last 6 months. Figures are respectively 73% and 46% for men. Alcohol consumptions vary significantly by age-group, highest among adults between 25 and 54 years old, and by level of education, the higher the last, the higher the alcohol consumption. In 2001, 64% of women declared to drink alcohol at least once in a week, and 19% declared at least one excessive alcohol consumption during the last 6 months. Figures are respectively 75% and 50% for men.

Data

In order to have an overview of the health status of the population in Belgium, heath interview surveys are regularly conducted in Belgium since 1997. These surveys have for objectives to draw a general description of the physical and mental health status of the population, the use of preventive and curative health care, and life style habits (e.g. nutrition, alcohol and tobacco consumption). The present paper will be based on the data from the 2001 and the 2004 surveys. Both surveys are based on a multistage cluster sample. Data were gathered using three questionnaires: a face-to-face household questionnaire administered to the reference person, and for each individual included in the survey, a self-administered and a face-to-face questionnaire. For 2001, 9,366 persons aged 15 or more were included in the analysis, and 9,423 for the 2004 survey.

Questions about alcohol consumption concern excessive alcohol use (defined as consumption of at least 6 glasses of alcoholic beverages during one day at least once in the past six months) and "usual" consumption of alcoholic beverages during the days of the week and during the weekend. These questions were self-reported as well as the question about subjective health. Data used in the analyses are the following: presence of both physical or psychological problems, self-declared diseases and handicaps, social support (appreciation about social relationships and functional content of social support), utilisation of health services, including use of medicines such as tranquilizers, and a proxy of a measure of self-efficacy was elaborated using questions derived from the General Health Questionnaire-12 (screening questionnaire for assessing mental health). Two socio-economic variables, education and family income, are also included in the analysis.

Methods

In an attempt to answer our query, controlling for the impact of other possible determinants of subjective health, we develop a multiple-equation *structural equation model* (SEM) of self-rated health taking into account the direct and indirect paths leading from the various possible exposures to the outcome, drawing on the data from the Belgian health surveys. A causal effect is measured by a regression weight indicating the impact of the variable at the base of each arrow on the variable at the head of the arrow. Single-equation models have the disadvantage of mixing together covariates and confounders, controlling for all variables even when control is not always required or is even damageable, such as in the case of intervening variables. A single-equation model leaves the causal structure largely unspecified and is therefore too theory-parsimonious. A major advantage of SEM is on the contrary giving a

precise picture of one's hypothetical causal structure, distinguishing the network of paths among variables, both direct and indirect, and separating confounders from intervening variables. As regards causality, in addition to being identified and fitting the data adequately, a SEM should be congruent with background knowledge and should be structurally stable (Russo *et al.*, 2006).

A problem with the classical SEM approach is that it uses methods such as maximum likelihood estimation (MLE) which require continuous variables. Ordinal variables such as those used here do not behave like continuous ones. In this case, alternatives to MLE are required, especially if the ordinal variables have few categories, are highly skewed, or are not assumed to reflect underlying continuous variables. We have used *Bayesian inference* to estimate the parameters of the models. Bayesian methods are more flexible than classical ones and are thus better suited to deal with ordinal variables than MLE or least squares estimation techniques. In particular, asymptotic assumptions are not needed. Bayesian inference uses Bayes' theorem to combine prior information with the new information contained in the data set. One starts by specifying firstly *prior distributions* for each of the model unknowns and secondly the likelihood of the data. As a mathematical solution for the *posterior distributions* is usually too complex, the latter are actually obtained from the data and priors iteratively, using a Markov Chain Monte Carlo procedure (Dunson, Palomo and Bollen, 2005 ; Lee, 2007). The linear recursive SEM developed here has been fitted using the AMOS software Version 7.0 for the analysis of moment structures (Arbuckle and Wothke, 1999).

Results
Data analysis is presently under way.