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Modeling the impact of alcohol dependence on mortality burden and the effect of available treatment interventions in the European Union

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Abstract
Alcohol consumption is a major risk factor for the burden of disease, and Alcohol Dependence (AD) is the most important disorder attributable to this behavior. The objective of this study was to quantify mortality associated with AD and the potential impact of treatment. For the EU countries, for the age group 15–64 years, mortality attributable to alcohol consumption in general, to heavy drinking, and to AD were estimated based on the latest data on exposure and mortality. Potential effects of AD treatment were modeled based on Cochrane and other systematic reviews of the effectiveness of the best known and most effective interventions. In the EU 88.9% of men and 82.1% of women aged 15–64 years were current drinkers; and 15.3% of men and 3.4% of women in this age group were heavy drinkers. AD affected 5.4% of men and 1.5% of women. The net burden caused by alcohol consumption was 1 in 7 deaths in men and 1 in 13 deaths in women. The majority of this burden was due to heavy drinking (77%), and 71% of this burden was due to AD. Increasing treatment coverage for the most effective treatments to 40% of all people with AD was estimated to reduce alcohol-attributable mortality by 13% for men and 9% for women (annually 10,000 male and 1700 female deaths avoided). Increasing treatment rates for AD was identified as an important issue for future public health strategies to reduce alcohol-attributable harm and to complement the current focus of alcohol policy.

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1. Introduction

Alcohol use disorders, commonly defined as comprising alcohol dependence (AD) and alcohol abuse (American Psychiatric Association, 1994), are globally one of the most prevalent mental disorders, affecting an estimated 3.6% of the population between 15 and 64 years of age worldwide (men: 6.3%; women 0.9%) (Rehm et al., 2009). There are marked regional variations in prevalence, with the World Health Organization's European region showing the highest prevalence in this age group (5.5% total; men: 9.1%; women 2.0%). Within the European region, Russia and surrounding countries have the highest prevalence, but the European Union (EU) also shows a high prevalence (Rehm et al., 2005; Wittchen et al., 2011).

The public health impact of alcohol use disorders, as with most other mental disorders, has been mainly seen as disabling rather than fatal, especially in comparison to cardiovascular disorders and cancer (Samokhvalov et al., 2010; World Health Organization, 2008). The disabling effects manifest themselves in absenteeism from work, failure to fulfill one's social roles, and other interpersonal problems and functional problems in daily life (Ormel et al., 1994; Samokhvalov et al., 2010). As most of the public health impact of alcohol use disorders stems from AD (Langlois et al., 2011; Samokhvalov et al., 2010), we will restrict ourselves to this disorder.

The underlying evidence for the conclusion that the consequences of AD are disabling rather than fatal stems from the Global Burden of Disease (GBD) studies (Lopez et al., 2006; World Health Organization, 2008). The GBD estimates with respect to mortality associated with AD in turn have been based on the review of Harris and Barraclough (Harris and Barraclough, 1998), indicating a Standardized Mortality Ratio (SMR) of 1.80 (95% confidence interval (CI): 1.76–1.84) for men and of 3.84 (95% CI: 3.54–4.15) for women. In other words, people with AD have a 1.8 or 3.8 fold higher ratio of observed deaths to expected deaths for men and women respectively, where expected deaths are calculated based on the age- and sex-comparable general population. However, the Harris and Barraclough review is quite out of date, with more than 30 new studies appearing since 1998 (Roerecke and Rehm, 2012). Also, most of the more recent estimates of mortality risks associated with AD have been markedly higher than those reported in the Harris and Barraclough review, especially those estimates based on treated samples (for two examples see: (Campos et al., 2011; Hayes et al., 2011)). Studies on mortality of AD in general populations showed lower risk than treatment, but still elevated risk compared to the general population without AD (Dawson, 2000; Fichter et al., 2011).

It is the aim of this contribution to look into the mortality impact of AD in the EU based on the latest available information on exposure, risk relations and mortality. More specifically, we estimate the impact of AD on mortality in each of the member states of the EU, and aggregate the results for the EU as a whole. In a second step, we compare estimates of AD-attributable mortality to estimates of the impact of alcohol consumption overall and of the impact of heavy drinking in the EU. The approach to estimate on the country level and then aggregate is necessary as drinking cultures vary markedly between regions in Europe, and sometimes vary from country to country or even within countries, based on product traditions, drinking patterns, and social reactions to alcohol (Iontchev, 1998; Popova et al., 2007; Room, 2010).

AD seems to have a marked effect on mortality, and one way to reduce this effect could be by treatment. There are effective treatment options for this condition, leading either to abstinence, or to a reduction in heavy drinking days and overall consumption (Magill and Ray, 2009; Rösner et al., 2010a, 2010b; Smedslund et al., 2011). However, less than 10% of all people with AD are currently treated in the EU, which is the lowest treatment coverage of any mental disorder (Alonso et al., 2004; Rehm et al., 2012). Thus, as a last step, we estimate the effects of increased treatment interventions on the associated burden of AD.

2. Experimental procedures

2.1. Definition of population

Population was restricted to the 27 countries of the EU. We restricted age to 15–64 years, as death certificates are less reliable with respect to cause of death in older age (Harteloh et al., 2010), and especially for the very old (Alpérovitch et al., 2009). Also, the relative risks for alcohol-attributable causes tend to decrease with age (Klatsky and Udaltsova, 2007). As a result, the consequences of consumption, both detrimental and beneficial, tend to be exaggerated in the older age groups when age-unspecific relative risks from meta-analyses are used as is commonly the case. A second reason to restrict ourselves to people less than 65 years of age was our aim to concentrate on premature mortality, as this age threshold has often been used in the European context to define premature mortality (Lapostolle et al., 2008). The under 15 year-olds were excluded since alcohol-attributable deaths in this age group are very rare, except as the result of the impact of someone else's drinking (e.g., traffic fatalities caused by drunk drivers).

2.2. Definition of exposure categories

Alcohol consumption status was measured in three categories: lifetime abstainers, former and current drinkers. For current drinkers, average alcohol consumption in grams of pure alcohol per day was used as the main exposure variable.

Heavy drinking was defined as the average daily consumption of alcohol at or above 3.33 standard drinks for women (40+ g of pure alcohol) and 5 standard drinks for men (60+ g of pure alcohol). The heavy drinking categories were taken from the European Medicines Agency guideline on the development of medicinal products for the treatment of AD (European Medicines Agency, 2010) based on the monitoring guide of the World Health Organization (World Health Organization, 2000; see Web Appendix A—2.1 for additional details). Alcohol dependence was operationalized by standardized assessment based on either ICD or DSM (Rehm et al., 2005). Exposure data for alcohol consumption on a country basis were obtained from the World Health Organization Regional Office for Europe which was processed by the routines implemented in the Global Information System on Alcohol and Health (for more details see Shield et al., 2012b and http://www.who.int/gho/alcohol/en/index.html). Following the methodology developed for the Comparative Risk Assessment for alcohol of the GBD 2005/2010 study (Kehoe et al., 2012; Rehm et al., 2010b), information from general population surveys was triangulated with adult *per capita* consumption to correct for undercoverage (Rehm et al., 2007).