Alcohol consumption, alcohol dependence and attributable burden of disease in Europe

Potential gains from effective interventions for alcohol dependence

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Foreword

Alcohol remains Europe's favourite drug. While overall alcohol consumption in Europe has remained relatively stable over recent years, it still contributes to a substantial burden of disease and premature deaths. Along with smoking and obesity, alcohol is a leading preventable cause of ill health. Further, although overall per capita consumption of alcohol is relatively stable, this conceals variation between countries: alcohol consumption has increased in some Northern and Eastern European countries compared to reductions in traditionally wine-drinking countries. In addition to the health consequences, alcohol contributes to a wide range of social and criminal justice costs—placing a considerable burden on the European economy.

This report provides a timely and comprehensive review of the relationship between alcohol consumption and harm in Europe. While European alcohol strategies have typically focused on reducing alcohol misuse through controls on availability, marketing and price, and drunk-driving countermeasures, this report highlights the considerable potential to reduce alcohol-related harm through wider implementation of individually directed interventions for people with alcohol dependence. There is now a considerable evidence base which supports the effectiveness and cost effectiveness of brief interventions, and a range of specialist treatment for people with alcohol use disorders. However, this report highlights the current gap between evidence and practice. Less than 10% of people with alcohol dependence receive treatment in Europe; and yet alcohol dependence accounts for a substantial proportion of all harm associated with alcohol.

Rehm and colleagues provide a compelling case for action in Europe—at both an individual country level and a pan-European level to make treatment for alcohol dependence more widely available. The current patchwork of services for people with alcohol dependence has resulted from a lack of strategic direction and a failure to exploit knowledge we already possess on what works in helping people to reduce or stop drinking alcohol. Many European countries have no national or professional guidelines to inform clinicians and commissioners of health care.

Increasing the proportion of people with alcohol dependence who gain access to effective treatment must now be a Europe-wide priority. In doing so, one must not underestimate the potential challenges including training for health professionals and costs of implementation. However, given the proven cost-effectiveness of treatment for alcohol dependence, such investment is likely to yield significant cost savings as well as reduced human suffering.

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Wake-up call for Europe's drinking problem

This study is a wake-up call that the European Union has a drinking problem. And not just a drinking problem, but an enormous drinking problem. Any practicing doctor, particularly a family doctor, as I was, or a liver doctor or psychiatrist, will know the devastation that being dependent on alcohol wreaks on the lives not just of the drinker, but also on those of family, friends and work colleagues. It is simply awful. Terrible though alcohol dependence is, as a public health doctor, I always thought it the tip of the iceberg of alcohol-related public health problems. But, according to this study, when it is fully analysed, heavy drinking and alcohol dependence **is** the iceberg. And at the public health level, it is also simply awful. For all drinking as a whole, one in seven of all male deaths in the European Union in the age range of 15–64 years is due to alcohol, and one in 13 of all female deaths. According to this report, seven out of ten of these deaths come from alcohol dependence, and nine out of ten of all the European ill-health and premature death due to alcohol comes from heavy drinking (defined here as 60+ grams of alcohol per day for men and 40+ for women).

Dealing with Europe's drinking problem

In their joint submission to the 2011 UN high-level meeting on non-communicable diseases, the World Economic Forum and the World Health Organization (2011) listed the three "best buys" for alcohol policy as price increase, limits on availability and bans on advertising. This report on alcohol dependence clearly demonstrates that brief interventions for heavy drinking, and treatments for alcohol dependence, urgently need to be added to this list, to try to close the immoral gap between need and uptake of effective evidence-based treatment.

Why has Europe got it so wrong?

The fact that the European Union has a drinking problem, and that its overall consumption (at more than twice the world's average) has remained static in the last ten years, suggests that the European Union is not doing at all well. By their own admission, for the most part, countries themselves say that they have been doing the wrong things. Over the five years 2006–2010, according to the 2012 World Health Organization report on Alcohol in the European Union (Anderson, Møller & Galea 2012), areas of policy that got stronger in European Union countries were primarily more education and more community action; and the policy areas that did not get stronger, or got weaker, were pricing and advertising. This is simply the wrong way round, given the evidence on what might have made a difference to reducing the harm done by alcohol. To some extent, of course, these countries were consistent in following the advice that they were given—the European Commission's Communication on

Alcohol (2006) had a lot to say about the importance of more education, but hardly anything to say about the importance of price. There has been a lot written about why this is (Gordon & Anderson 2011). One suggested reason has been the policy influence of the alcohol industry itself—the EC Communication being well aligned with the industry's views on alcohol policy. Further, the European body invited to broker discussion between the alcohol industry and public health actors, the European Policy Centre, has industry's views at heart—having been employed, for example, by the tobacco industry to lobby the European Commission in the industry's commercial interests (Smith et al 2010).

The Commission purports to engage the alcohol business through its Alcohol and Health Forum. But this has not been done in any meaningful way, with engagement being at too low a level, and expectations too trivial—often only at the level of public relations, such as financing alcohol education or running voluntary codes on advertising content (Celia et al 2010). The European Commission's complicity, along with the NGO community that has gone along with the process, has cost lives: 600,000 European Union citizens have died from a preventable alcohol-caused death over a five-year time span of the Commission's Communication.

Interestingly, the UK government's alcohol strategy, launched in March 2012, illustrates what meaningful action by the alcohol industry might look like: removing 8 billion grams of alcohol from the market by 2015 by selling products with a lower alcohol concentration, incentivized by lower taxes on lower-alcohol strength beers (Her Majesty's Government 2012). This would mean that these 8 billion grams of alcohol are not consumed by anyone and thus cannot create harm. There is a desperate need for the European Commission to get it right the next time round in its communication on alcohol—perhaps by considering that the well-being and health of the people of Europe actually matter.

Enter the pharmaceutical business

When I was regional advisor for tobacco control in the WHO European Office in the late 1990s, I set up a public/private sector partnership between WHO, European public health, and four pharmaceutical companies manufacturing treatment products for nicotine dependence. This was a highly successful initiative in making a real difference, but perhaps what was shocking was that it took the pharmaceutical business to drag the reluctant public-health sector into the real world of urgency to help smokers quit smoking—through both implementing effective tobacco policy and making evidence-based treatments much more accessible. Perhaps this report can be a similar wake-up call for more urgent and effective European action on alcohol.

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Executive Summary

Alcohol consumption has been deeply embedded in European culture for centuries. While the current volume of alcohol consumption in the European Union (EU) has been stable for several years, it is still high—more than twice the global level. There are also diverging regional trends: the traditional wine-drinking countries have been reducing alcohol consumption for more than two decades, while the Nordic countries, the Central-East and Eastern EU countries and the British Isles have been increasing consumption over the past decade(s). Within Europe, drinking patterns vary considerably: there are more irregular occasions of heavy drinking in Eastern European and Nordic countries, as well as in the British Isles.

Alcohol consumption is a contributory cause of more than 200 illnesses defined by the International Classification of Diseases (ICD-10) as three-digit disease codes. These are mostly in a dose-response manner—i.e. the more alcohol consumed, the higher the risks for alcohol-attributable disease. As a consequence, in the EU in 2004, almost 95,000 men and more than 25,000 women, aged 15 to 64, died of alcohol-attributable causes (total 120,000). This means that 1 in 7 male deaths, and 1 in 13 female deaths, in this age category were caused by alcohol. (These net numbers have already taken into consideration the protective effect of alcohol consumption on ischemic disease and diabetes.) The proportional contribution to morbidity and disability is even higher. This makes alcohol consumption one of the most important risk factors for avoidable mortality and disease in early and middle adulthood.

Most of the health harms related to alcohol are caused by heavy drinking. Almost 80% of all male net deaths attributable to alcohol, and about 67% of all female alcohol-attributable net deaths, were due to heavy drinking—defined as consuming at least 60g of pure alcohol per day for men, and at least 40g for women. With respect to the burden of disease, heavy drinking accounted for an even higher proportion of alcohol-attributable net Disability-Adjusted Life Years (DALYs) lost, with almost 90% of the burden caused by this form of consumption. Heavy drinking, both regular and irregular, thus causes the overwhelming majority of the alcohol-attributable health burden.

The most important cause of the significant health burden is alcohol dependence—both directly, as a disease, and indirectly, as a risk factor: alcohol dependence causes both mortality and diseases such as liver cirrhosis and cancer. Most of the impact of alcohol dependence seems to be mediated by irregular and regular heavy drinking. In 2004, alcohol dependence accounted for more than 70% of the overall alcohol-attributable net mortality before age 65, and proportionally more in younger age groups. This proportion is all the more astonishing since alcohol dependence (like other mental disorders) is usually classified as disabling but not fatal.

While the impact of alcohol consumption and dependence on mortality and disease is substantial, there are also many social and economic burdens resulting from the effects of alcohol on individuals, families, workplaces, and society as a whole. This means that alcohol consumption and dependence have sizable impacts on many people other than the drinker. Among the most devastating effects are insufficient fulfillments of roles; family problems, including divorce; problems with parenting at the family level; and lost productivity in the workplace. These effects add up to a staggering number of alcohol-attributable social costs, which can be estimated at €155.8 billion a year in Europe. To this must be added the intangible, non-monetary costs such as pain and emotional suffering.

However, a substantial portion of the alcohol-related burden is avoidable. Cost-effective measures exist to reduce it by preventative measures such as taxation of alcohol, bans on alcohol marketing, and drunk-driving countermeasures. Still, considering the current toll of alcohol dependence in Europe, additional measures should be taken to reduce its effect. Treatment of alcohol dependence should play a key role in future policy, since the condition is extremely undertreated: less than 10% of Europeans living with alcohol dependence receive treatment. This lack of mental-health care is alarming, since many effective treatment options are available. Increasing treatment coverage is a realistic goal, and would provide measurable results in lowering alcohol-related harms, even in the short term.

To quantify the potential reduction of alcohol-attributable mortality by treatment, five different intervention scenarios were modelled. Their aim was to increase treatment to up to 40% of all people with alcohol dependence in Europe. These scenarios were based on interventions that had been proven to be efficacious in randomized clinical trials: pharmacotherapy with counselling, cognitive behavioural therapy, motivational interviewing, and two brief interventions. The effect sizes of these interventions were determined using results from Cochrane reviews and meta-analyses. Overall, it was found that pharmacotherapy and brief interventions in hospitals had the largest effects on reducing mortality.

Overall, the most effective type of intervention was pharmacotherapy. If 40% of all people with alcohol dependence were treated this way, the result would be a reduction of 11,740 deaths in the EU (10,040 men and 1,700 women) in just the first year—a decrease of 13.3% of alcohol-attributable deaths in men, and almost 9.3% in women. (This corresponds to 1.5% of all deaths in men, and 0.5% in women, in 2004.) These numbers take into consideration both abstinence and a reduction of alcohol consumption as possible treatment outcomes.

In summary, given the substantial health burden attributable to alcohol dependence in Europe, it is recommended to supplement the proposed alcohol prevention policies with other measures designed to increase treatment rates and the provision of appropriate services. Alcohol policy should strive for an integrated package of various forms of effective prevention measures, such as a taxation increase, limitations on availability, and bans on advertising. These measures should be supplemented by interventions for problem drinkers, and psychotherapeutic and pharmacological treatment for people with alcohol dependence.

Regions and Countries of the European Union (total 27 countries)

(Note that the italicized countries—Iceland, Norway and Switzerland—are not EU member states; they are included only for comparison, and are not included in the EU average)

Central-East and Eastern Europe (10 countries): Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

Nordic Countries (5 countries): Denmark, Finland, *Iceland, Norway*, Sweden

Central-West and Western Europe (9 countries): Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, *Switzerland*, UK

Southern Europe (6 countries): Cyprus, Greece, Italy, Malta, Spain, Portugal

Abbreviations Used

AA: Alcoholics Anonymous

AAF: Alcohol-Attributable Fraction

AD: Alcohol Dependence

ADT: Alcohol Dependence Treatment

AUD: Alcohol Use Disorders—defined in most conventions as comprising Harmful Use of Alcohol, and Alcohol Dependence (when using the International Classification of Diseases, ICD), or as Alcohol Abuse and Alcohol Dependence (when using the Diagnostic Statistical Manual of Mental Disorders, DSM)

BI: Brief Interventions

CBT: Cognitive-Behavioural Therapy

CI: Confidence Interval

CRA: Community Reinforcement Approach

CVD: Cardiovascular Disease

DALY: Disability Adjusted Life Year

EU: European Union

GBD: Global Burden of Disease

GDP: Gross Domestic Product

GDP PPP: Gross Domestic Product Purchasing Power Parity

ICD-10: International Classification of Diseases, 10th Revision

IHD: Ischemic Heart Disease

MI: Motivational Interviewing

MET: Motivational Enhancement Therapy

PYLL: Potential Years of Life Lost

RR: Relative Risk

SMR: Standardized Mortality Ratio

WHO: World Health Organization

YLD: Years of Life Lost Due to Disability

YLL: Years of Life Lost

The Aim of This Book

Alcohol consumption has often been described as a double-edged sword. On the one hand, it is deeply engrained in many cultures, certainly in all European cultures, and thus contributes to pleasure and positive well-being.[1] On the other hand, it is a major risk factor for health harms, and also contributes to a personal and social burden of disease and injury.[2]

This book's first objective is to describe the use of alcohol in Europe in the 21st century, using the latest available statistics for the European Union (EU) as a whole, and for its individual countries. This report focuses almost exclusively on the adult population: that is, on people aged 15 to 64. Few people younger than 15 experience severe negative health consequences of their drinking; and alcohol consumption tends to decrease markedly after age 60, in both sexes, in almost all countries. For comparison, we include three countries closely associated with the EU—Iceland, Norway, and Switzerland—plus Russia as an external comparison, and as a semi-European country with a high level of problems caused by alcohol.[2-5]

The second objective of the book is to estimate the burden of disease and injury attributable to alcohol consumption, based on the methodology developed in the Comparative Risk Assessments within the Global Burden of Disease (GBD) studies (see reference 2 for results, and references 6-8 for methodology). In addition, we review the social and economic burdens attributable to alcohol. The third objective is to estimate the contribution of Alcohol Dependence (AD) to the overall burden of disease and injury.

The burden of death and disease due to alcohol consumption or AD is, in principle, avoidable; and even in practice it can be markedly reduced. (An example is the effect of the so-called Gorbachev reform on alcohol-attributable mortality at a population level).[9-10] The literature so far has concentrated on the effects, at the population level, of policy interventions such as taxation increases, bans on marketing, and implementation of laws to prevent drunk driving.[11-13] This book proposes to supplement the literature with estimates of the effects of interventions for AD at the individual level, i.e. of improving the availability of effective treatment options. Again, these effects will be presented for the EU as a whole, and separately by country. We conclude with policy recommendations for reducing the burden of alcohol consumption in Europe.

Traditional Patterns of Alcohol Consumption in Europe

Alcohol consumption has a long tradition in Europe. Looking at drinking cultures across the continent, three distinct traditional regional patterns can be identified:

- Wine-drinking countries in the Mediterranean region, where alcohol is consumed daily, usually with meals.
- A Central-West and Western region with a similar style, but with beer as the beverage of choice; and proportionally less drinking with meals, and more drinking without consuming food.
- In the Nordic countries and in the Central-East and Eastern part of Europe, a style of irregular heavy drinking.

Although these characteristics of traditional drinking cultures still linger today, modern lifestyles have become more globalized. Consequently, drinking patterns have become more similar across Europe, and will continue to homogenize.

Europe has a long tradition of consuming alcohol, with both the Greeks and Romans being classic examples of societies with a fairly widespread use of alcohol.[14-15] However, this by no means indicates that alcohol consumption is uniform across Europe. On the contrary, different drinking cultures can be distinguished based on the products made, the patterns of drinking, and the social reactions to alcohol.[16-18] There are essentially three such cultures:

• The Mediterranean pattern: wine countries in the south are traditionally characterized by almost daily drinking of alcohol—most often wine, and most often consumed with meals. These societies avoid irregular heavy drinking, and have no acceptance of public drunkenness. Especially in the southeast of the EU, wine is now complemented by fruit liquor.

• The Central European pattern: beer is the dominant alcoholic beverage, and its consumption is similar to the Mediterranean style, both in frequency of drinking and in the lack of acceptance of public drunkenness (although in recent decades there has been more acceptance of intoxication).[19] However, there is more consumption outside of meals, and there are more alcohol-related problems.

• The Northern European pattern: the drinks of choice are vodka and spirits, whose production only began after the invention of the distillation process—hence it has a substantially shorter tradition than wine drinking in the Mediterranean region. The pattern of drinking in these countries is characterized by non-daily drinking, in irregular episodes of heavy and very heavy drinking (e.g. during weekends and at festivities); and by a much higher level of acceptance of public drunkenness. (This style was once also prevalent in the UK and Ireland, but with more dominance of beer and less of spirits.) The former Soviet Bloc countries had different policies, as the state was always ambivalent about alcohol. On the one hand it recognized vodka's deleterious effects in the workplace and in daily life, but it also considered it an "opiate for the people."

There is some speculation that these differences in drinking styles can be traced back to antiquity,[20] even though drinking cultures have changed a great deal during different times of history. In Europe today, it seems that the local drinking style is less strongly associated with regional patterns than before.[21] For example, adolescents and young adults in many traditional wine-drinking regions now prefer alcoholic beverages other than wine. Thus, while we still find characteristics of the old drinking cultures, modern lifestyles have become more globalized. Overall, spirits are still less important in Europe; beer is the most-consumed beverage, followed by wine; and the practice of drinking alcohol at both lunch and dinner, on a regular basis, has become almost nonexistent in all countries.

Key Indicators of Alcohol Consumption in Europe

On average, Europe's level of alcohol consumption is more than double the global average. The overall trend in levels of consumption has been stable for the past decade, but there are regional trends toward slightly increasing consumption in some places—the Central-East and Eastern-region countries, the Nordic countries, and the British Isles—plus an opposite trend toward decreasing consumption in the Southern and the Central-Western regions. However, variation between countries in **levels** of drinking is less pronounced than the variation in **patterns** of drinking: binge drinking is more pronounced in the Northern and North-Eastern parts of Europe, and in the British Isles. These regional differences and their implications are one of the focal points of this assessment.

Drinking status and volume of drinking

The economic and political union of the EU currently encompasses a wide variety of nations and cultures: 27 member states located across Europe. Excluding overseas territories (such as the French departments in Guiana, Guadeloupe and Martinique), the westernmost member is Ireland, and the easternmost members are Cyprus to the south, and Finland in the north. In 2005, the total population (including children and adolescents) was close to 500 million; the union passed the 500 million mark in 2010.[i] On average, every EU country had over 16 million adult inhabitants (aged 15 and above) in 2009, the latest year with available data on per capita consumption. In that year, 5.6% of adult men and 13.5%

i See online: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tps00001&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

of adult women were lifetime abstainers from alcohol; and 7.3% of men and 11.0% of women identified as “former” drinkers. Some of these people were at increased risk for health issues, including death—as “sick quitters,” they had stopped drinking for health reasons.[22-23]

An overview of key alcohol-consumption indicators for different EU countries is provided in Table 1. As most calculations are restricted to people aged 15 to 64, the prevalence given applies to this age range as well. Even though there is considerable variation between countries, it is clear that EU countries as a whole can be characterized by a low rate of abstention, and a high rate of people who drink more than 40g of pure alcohol per day. In fact, compared to the rest of the world,[24] the EU has the highest proportion of people who drink that much every day, of any region except the Eastern European countries around Russia.

In the categories[25] from the European Medicines Agency,[ii] adapted from the World Health Organization[26]: in the EU for the year 2009, 15.0% of the men were drinking an amount (i.e. 60 g+ pure alcohol a day) that put them at a “high” or “very high” risk of both chronic and acute health harms; and 7.7% of the women were at this risk level (defined as drinking 40 g+ pure alcohol a day). This results in an “at risk” population of 11.2%. Of course, these proportions are higher for the age groups focused on in this report. In that target group, 16.1% of men and 9.3% of women were drinking at a “high” or “very high” risk level, for a combined total of 12.7%. (See Table 1 for details at the country level.)

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ii See online:
http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2010/03/WC500074898.pdf

Table 1: Key alcohol consumption indicators

The table below describes key indicators of alcohol consumption, broken down by country and sex, for people aged 15–64 living in the EU. (All figures are for the European Medicines Agency/WHO, drinking categories for risk, 2009.)

	Men						Women					
			Prevalence of average alcohol consumption						Prevalence of average alcohol consumption			
Country	Lifetime abstainers	Former drinkers	>0-<40 grams	40-<60 grams	60-<100 grams	100+ grams	Lifetime abstainers	Former drinkers	>0-<20 grams	20-<40 grams	40-<60 grams	60+ grams
Austria	4.0%	5.3%	62.5%	11.2%	11.4%	5.5%	4.6%	7.5%	62.9%	14.9%	5.8%	4.3%
Belgium	2.8%	6.2%	65.0%	10.9%	10.5%	4.6%	6.8%	5.6%	64.5%	14.3%	5.2%	3.5%
Bulgaria	9.2%	4.7%	60.4%	10.4%	10.4%	4.9%	20.7%	4.9%	53.5%	12.7%	4.8%	3.3%
Cyprus	5.7%	5.0%	68.6%	9.7%	8.2%	2.9%	8.8%	6.2%	67.5%	12.0%	3.6%	1.9%
Czech Republic	2.9%	6.7%	56.7%	11.9%	13.8%	8.1%	4.2%	12.5%	55.9%	15.2%	6.6%	5.7%
Denmark	0.5%	2.0%	69.7%	11.6%	11.2%	4.9%	0.5%	5.3%	70.8%	14.9%	5.2%	3.3%
Estonia	6.5%	17.8%	46.0%	10.1%	12.2%	7.5%	10.9%	17.1%	47.1%	13.4%	6.0%	5.6%
Finland	2.8%	4.7%	65.7%	11.1%	10.8%	4.8%	5.8%	2.8%	68.1%	14.7%	5.2%	3.4%
France	1.5%	2.8%	67.9%	11.5%	11.2%	5.0%	1.8%	5.3%	69.1%	14.9%	5.3%	3.5%
Germany	1.1%	2.0%	68.7%	11.7%	11.4%	5.1%	1.0%	1.9%	73.2%	15.3%	5.3%	3.3%
Greece	5.5%	7.4%	63.6%	10.2%	9.4%	3.9%	11.5%	14.2%	51.9%	12.9%	5.2%	4.2%
Hungary	3.8%	9.3%	57.3%	11.1%	12.0%	6.4%	6.2%	9.5%	61.0%	14.3%	5.4%	3.7%
Iceland	4.5%	8.0%	72.6%	7.9%	5.5%	1.5%	8.0%	6.0%	74.0%	9.2%	2.1%	0.7%
Ireland	15.0%	4.4%	53.8%	10.2%	10.9%	5.6%	15.9%	3.8%	55.7%	14.1%	5.8%	4.7%
Italy	4.6%	3.1%	70.9%	10.0%	8.4%	3.0%	9.9%	4.4%	66.2%	13.0%	4.2%	2.4%
Latvia	5.0%	8.7%	49.7%	11.7%	14.9%	9.9%	11.0%	17.0%	41.4%	14.0%	7.4%	9.2%
Lithuania	3.7%	5.5%	60.4%	11.6%	12.4%	6.4%	13.5%	10.9%	52.0%	13.5%	5.6%	4.5%
Luxembourg	5.1%	5.1%	63.2%	10.9%	10.8%	4.9%	8.7%	6.2%	61.4%	14.3%	5.4%	4.0%
Malta	5.4%	5.1%	72.9%	8.5%	6.3%	1.8%	8.8%	6.1%	70.9%	10.4%	2.7%	1.1%

Netherlands	5.1%	9.9%	63.4%	9.6%	8.6%	3.4%	9.6%	14.7%	55.8%	12.3%	4.5%	3.0%
Norway	2.0%	5.0%	75.7%	8.9%	6.5%	1.9%	2.3%	5.6%	78.5%	10.4%	2.4%	0.9%
Poland	7.3%	8.3%	55.4%	10.8%	11.9%	6.4%	14.6%	10.2%	51.9%	13.4%	5.5%	4.4%
Portugal	15.8%	12.9%	44.1%	9.5%	11.1%	6.6%	27.0%	17.4%	31.2%	10.8%	5.8%	7.8%
Romania	7.0%	13.2%	48.1%	10.7%	12.9%	8.1%	13.2%	24.6%	35.9%	12.1%	6.3%	7.9%
Slovakia	7.8%	13.9%	48.8%	10.3%	12.1%	7.1%	5.1%	12.3%	58.7%	14.3%	5.6%	4.1%
Slovenia	3.9%	3.6%	60.1%	11.9%	13.2%	7.2%	5.8%	9.5%	58.5%	15.0%	6.2%	4.9%
Spain	8.0%	18.8%	46.0%	9.6%	11.1%	6.5%	27.6%	23.6%	27.2%	9.5%	5.1%	7.0%
Sweden	4.4%	5.3%	70.4%	9.5%	7.8%	2.7%	5.8%	8.8%	68.1%	11.9%	3.5%	1.8%
Switzerland	6.1%	3.2%	65.6%	10.7%	10.1%	4.3%	11.5%	3.8%	60.7%	14.5%	5.6%	3.9%
United Kingdom	7.5%	1.2%	64.8%	11.0%	10.7%	4.8%	8.5%	2.2%	65.9%	14.5%	5.3%	3.6%
Total (European Union)	5.0%	6.1%	62.1%	10.8%	10.9%	5.2%	9.5%	8.5%	59.1%	13.6%	5.2%	4.1%
For comparison: Russian Federation	9.7%	17.7%	42.7%	9.8%	12.2%	7.9%	24.1%	21.2%	31.8%	10.6%	5.5%	6.9%

Deriving indicators for alcohol consumption

Measures of alcohol consumption: definitions and procedures

This report defines the "drinking status" of individuals in three ways:

- current drinkers: people who have consumed alcohol at least once in the past year
- former drinkers: people who have consumed alcohol, but have not done so in the past year
- lifetime abstainers: people who have never consumed alcohol.

Data on drinking status were obtained from government statistics on per capita alcohol consumption, and from large representative population surveys undertaken in the 2000s.[24]

Average daily consumption of pure alcohol was calculated based on a triangulation of survey data and governmental data on per capita consumption, mainly derived from sales and taxation figures.[8] Triangulation is necessary because surveys tend to underestimate true consumption considerably, and with high variation: depending on the survey, consumption may be underestimated between 30% and 70%.[7] The consumption estimates are less biased, and serve as standardization.[8] In order to be consistent with the algorithms used in the GBD Comparative Risk Assessment for alcohol, 80% of per capita consumption of alcohol was used as the standard to account for alcohol bought but not consumed. It also helped to improve comparability with the Relative Risks (RRs) from cohort studies, where we would also expect people to underestimate their own consumption.

Total adult (15+) alcohol consumption for each country in 2009 was calculated by adding the estimated recorded and unrecorded per capita consumption, and then subtracting the volume of "tourist consumption" (alcohol consumed by non-residents).[7] Data on average consumption for each age group were then calculated, based on the proportion of alcohol consumed by each age and sex group—taking into account the relative population size of the groups, as well as the prevalence of current drinkers.

One subcategory of "current drinker" identified in the data was the binge drinker, defined as a person who had consumed at least five drinks (for men) or four (for women), on at least one occasion in the past month. Assuming the average drink size to be 12 grams, this indicates the consumption of some

50–60 g of pure alcohol.[iii] Estimates used for the prevalence of drinking status and for binge drinking were consistent with the GBD's 2005 Comparative Risk Assessment study estimates.[27]

For women, drinking while pregnant presents a number of risks that may affect the health of the newborn, such as by reducing its birth weight. The 2005 Comparative Risk Assessment study assumed that the pattern of women's drinking—that is, the proportion who drank the same amount as pre-pregnancy, the proportions who drank less, and the proportion of women who abstained from alcohol throughout pregnancy—was similar to estimates of such proportions for Canada and the United States. The prevalence of women who continued to drink while pregnant, but who drank less, was calculated according to Floyd and Sidhu,[28] by dividing the corrected average daily consumption by a factor of four.

Adult alcohol consumption in 2009

Average adult per capita consumption in the EU amounted to 12.5 litres of pure alcohol per capita for the year 2009 (on average, 1.6 L are unrecorded). While there is some variation, all European countries were well above the world average consumption of 6.1 L of pure alcohol per capita per year.[24] On the other end of the continuum, the new Eastern European member countries had not only a higher overall consumption, but also a higher unrecorded consumption (see Figure 2 and Table 2). The Central-West and Western European countries had an average adult per capita consumption of 12.4 L of pure alcohol (unrecorded 1 L); the Nordic countries had 10.4 L (1.9 L); Southern Europe 11.2 L (2.0 L); and the Central-East and Eastern European countries 14.5 L (2.5 L). (For exact definitions of geographical regions, see the chart on page 13.) Table 2, on page 25, gives an overview of consumption by country.

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iii See online: http://pubs.niaaa.nih.gov/publications/practitioner/pocketguide/pocket_guide2.htm

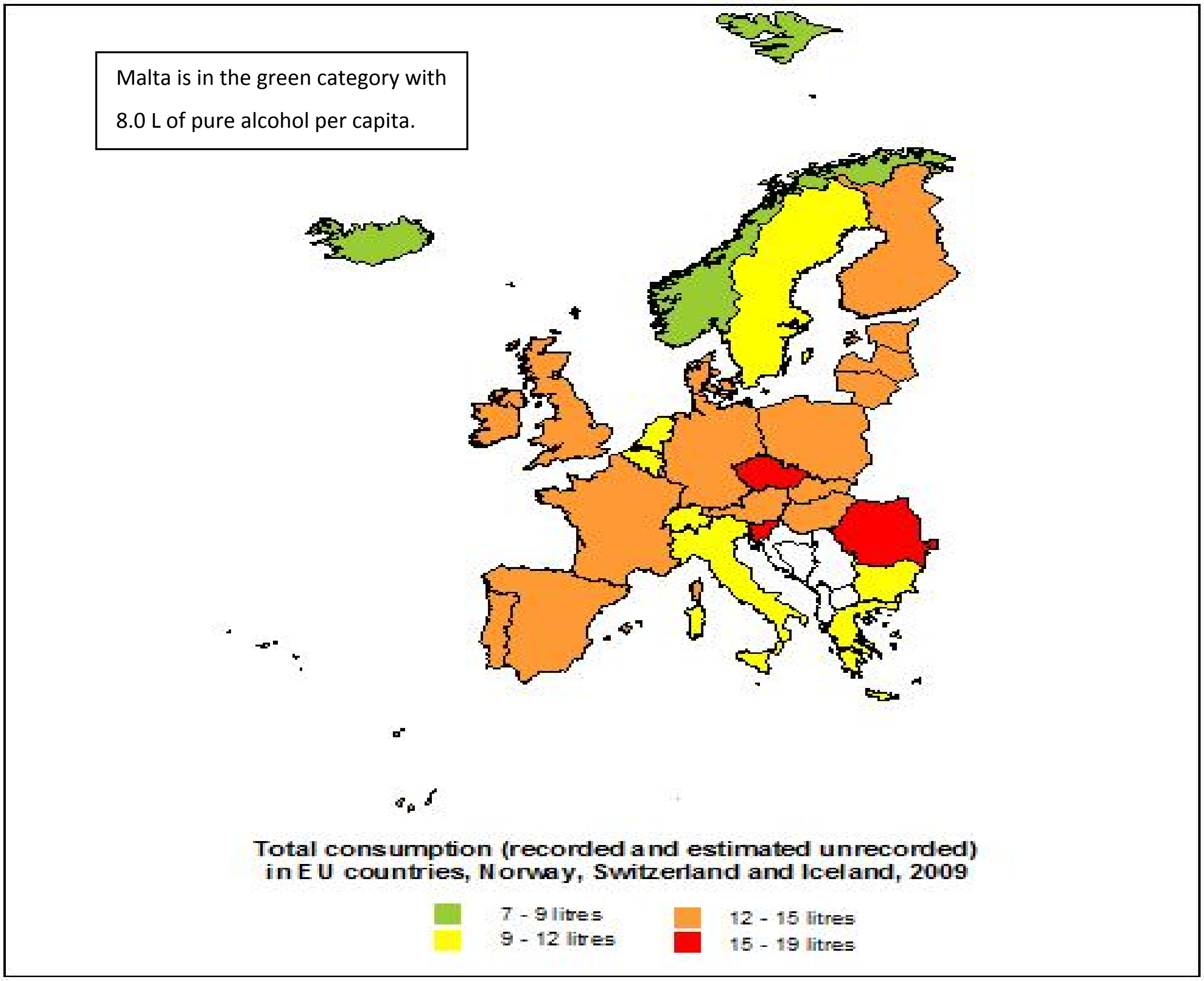


Figure 1: Adult consumption in litres

The figure above indicates the per capita consumption, in litres of pure alcohol, for adults (15+ years) in EU countries (2009).

Table 2: Adult consumption and drinking patterns

The table below outlines adult consumption and drinking patterns in Europe during 2009.

Country	Total per capita consumption (litres pure alcohol)*	Recorded per capita consumption (average 2008–2010)	Unrecorded per capita consumption	Pattern of Drinking
Austria	13.00	12.30	0.7	1
Belgium	12.00	11.00	1.0	1
Bulgaria	11.45	10.25	1.2	2
Cyprus	9.53	8.53	1.0	1
Czech Republic	16.61	15.11	1.5	3
Denmark	12.86	10.86	2.0	2
Estonia	14.05	13.35	0.7	3
Finland	12.27	9.97	2.3	3
France	12.70	12.30	0.4	1
Germany	12.87	11.87	1.0	1
Greece	10.55	8.67	1.8	2
Hungary	14.15	11.65	2.5	3
Iceland	7.93	7.53	0.4	3
Ireland	12.87	11.87	1.0	3
Italy	9.59	7.19	2.4	1
Latvia	Currently under review: 12.00-13.00	9.00	Currently under review: around 4.0	3
Lithuania	13.02	12.62	0.4	3
Luxembourg	12.76	11.76	1.0	1
Malta	8.01	7.61	0.4	1
Netherlands	9.73	9.23	0.5	1
Norway	8.30	6.7	1.6	3
Poland	13.60	10.60	3.0	3
Portugal	13.43	11.43	2.0	1
Romania	16.30	13.30	3.0	3
Slovakia	14.59	11.59	3.0	3
Slovenia	15.31	12.31	3.0	3
Spain	13.07	11.67	1.4	1
Sweden	8.85	8.15	1.7	3
Switzerland	10.76	10.26	0.5	1
United Kingdom	12.52	10.82	1.7	3
EU	12.45	10.85	1.6	2.1
For comparison				
Russian Federation	15.70		4.7	5

* Note that for the "total per capita consumption," the recorded average was for 2008–2010, plus the unrecorded estimate. In the red-shaded countries, adult consumption of alcohol is equal to or greater than 130% of the EU average. In the green-shaded

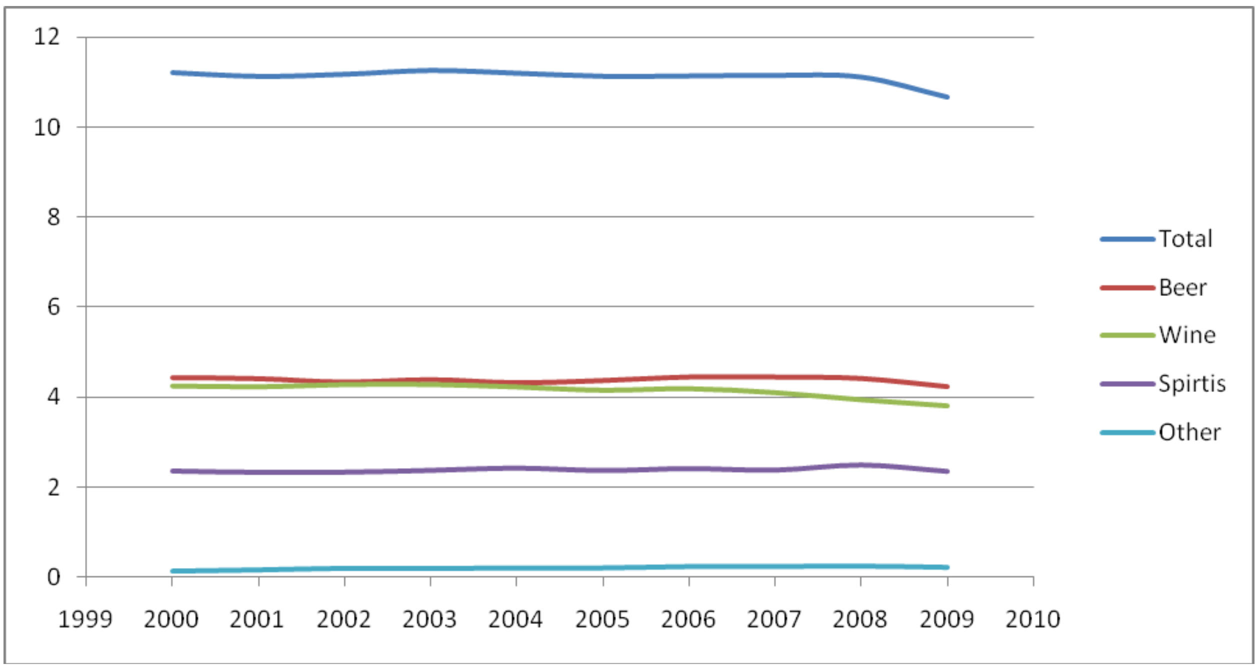
countries, consumption is equal to, or less than, 70% of the EU average. (Source: WHO Regional Office for Europe;[29] Global Information System for Alcohol and Health; and reference 24.)

Time trends in consumption

The recorded adult consumption for the EU as a whole has been constant over the past ten years (see Figure 2, based on WHO figures;[iv] the data up to 2004 are published in reference 24; the data for 2008 are in reference 30). Such trends can only describe recorded consumption, as most countries have not yet installed systems to regularly monitor unrecorded consumption. However, it is known that in most EU countries, unrecorded consumption has not changed markedly over the past decade.

Figure 2: Adult consumption in litres since 2000

The figure below shows the per capita alcohol consumption, in litres of pure alcohol, recorded for all EU adults (15+ years) since 2000.



While consumption for the EU as a whole has been stable, different trends can be observed for different regions (see Web Appendix 1). Southern European countries have decreased their alcohol consumption since 1999, part of an ongoing decrease over the past several decades.[31] In Spain, for example, a traditional wine country, beer has replaced wine as the beverage of choice. There have also been some decreasing trends in Central-West and Western Europe, except for the British Isles. However,

iv See online: http://apps.who.int/globalatlas/default.asp the Nordic countries, and the Central-East and Eastern European countries, have increased their consumption.[24] (See Web Appendix 1 for additional details.)

Patterns of drinking

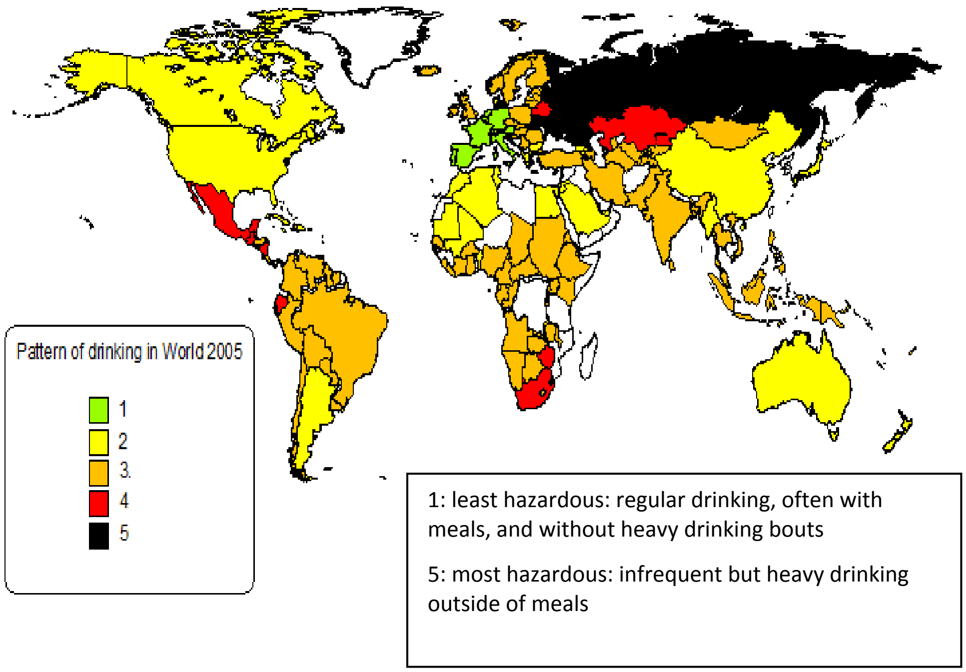
One element of this report is the creation of summary scores to define average "patterns of drinking" for different EU countries. These are composed of the following elements,[32] originally derived from an optimal scaling analysis of drinking indicators:[6]

- Heavy drinking occasions, including the frequency of getting intoxicated; usual quantity per drinking occasion; drinking spread out over more occasions; drinking at fiestas or special events; binge drinking over prolonged times. (These account for 64.7% of the score).
- Drinking with meals (23.5%).
- Drinking in public places (11.8%).

The average "pattern of drinking" score in the EU is 2.1, indicating alcohol consumption habits that are less detrimental than those in other regions of the world[6] (see Figure 3 for a global comparison). Patterns of drinking are more detrimental in the Central-East and Eastern European and Nordic countries, as indicated in Table 2, above. Russia and the surrounding countries have the most detrimental drinking scores.[18]

Patterns of drinking have been shown to be markedly related to the alcohol-attributable burden of disease, especially injury, ischemic disease, and HIV/AIDS.[6;33-36] The patterns have been incorporated into the Comparative Risk Assessments of the GBD study for 2000,[6;37] and will also be part of the estimations for the new GBD and Injury study for 2005 and 2010, to be published in 2012.[38]

Figure 3: Global patterns of drinking (2005)



Heavy drinking occasions

The frequency of consuming more than five drinks on one occasion is the most important single indicator in the pattern of drinking score. This indicator is available for many countries,[24] and has been shown to be linked to various forms of harm.[8;39] Having five drinks on any one occasion, almost daily or several times a week, is an indicator of chronic heavy drinking, and is linked to many categories of diseases (including non-communicable, mental-health, and infectious).[40] Five or more drinks, up to once a week, indicates irregular heavy drinking. Such behaviours are linked to specific health risks,[41] most importantly for ischemic heart disease. (In fact, the protective effect of moderate drinking on heart disease is completely wiped out if there are heavy drinking occasions at least once a month, even for average drinkers; see reference 35). Irregular heavy drinking occasions also have a marked effect on injury. While all heavy drinking has been associated with injury due to elevated blood alcohol concentration levels, *ceteris paribus* the effect of high blood alcohol on injury is more marked for people who drink less than chronic heavy drinkers. This is because the alcohol tolerance of the moderate group is lower, leading to a greater intoxicating effect from the same amount of alcohol. (See the classic studies referenced in references 42 and 43.)

Table 3: Frequency of drinking by country

The table below indicates the frequency of drinking more than five drinks at a time, on any occasion, in terms of daily, weekly, monthly, etc. The data (for 2009) are broken down by country;[44] the red-shaded cells indicate irregular heavy drinking occasions.

Country	several times a week	once a week	once a month	less than once a month	never	do not know
Austria	17%	19%	16%	23%	24%	1%
Belgium	12%	16%	15%	21%	36%	0%
Bulgaria	8%	10%	9%	15%	57%	1%
Cyprus	9%	17%	7%	12%	55%	0%
Czech Rep.	7%	17%	20%	32%	24%	0%
Denmark	7%	15%	24%	37%	17%	0%
Estonia	4%	14%	23%	26%	32%	1%
Finland	5%	17%	23%	33%	22%	0%
France	7%	13%	15%	20%	45%	0%
Germany	14%	22%	15%	23%	25%	1%
Greece	15%	19%	12%	20%	34%	0%
Hungary	11%	13%	16%	20%	40%	0%
Ireland	12%	32%	18%	22%	14%	2%
Italy	16%	14%	8%	12%	50%	0%
Latvia	3%	8%	15%	23%	50%	0%
Lithuania	6%	8%	14%	21%	51%	0%
Luxembourg	6%	12%	24%	35%	23%	0%
Malta	7%	19%	12%	31%	30%	1%
Netherlands	9%	14%	15%	24%	38%	0%
Poland	3%	16%	18%	34%	26%	3%
Portugal	20%	8%	9%	12%	50%	1%
Romania	19%	20%	13%	19%	27%	2%
Slovakia	5%	12%	21%	31%	30%	1%
Slovenia	8%	10%	18%	22%	42%	0%
Spain	15%	19%	13%	20%	33%	0%
Sweden	2%	11%	20%	32%	35%	0%
UK	14%	20%	14%	20%	31%	1%
EU	12%	17%	14%	22%	35%	1%

Alcohol-Attributable Burden of Disease in Europe

Alcohol consumption is a contributory cause of more than 200 ICD-10 three-digit disease codes, mostly in a dose-response manner (i.e. the more alcohol consumed, the higher the risks for alcohol-attributable disease). As a consequence, in 2004 almost 95,000 adult men, and more than 25,000 adult women (for a total of 120,000), died of alcohol-attributable causes in the EU. This means that 1 in 7 male deaths, and 1 in 13 female deaths, were caused by alcohol. Moreover, as alcohol consumption also contributes substantially to morbidity and disability, more losses could be attributed to this behaviour: in 2004 more than four million Disability-Adjusted Life Years were lost—either due to premature mortality, or to alcohol-related disability. Thus we can see that alcohol consumption takes an immense toll on the overall health of a country.

Acknowledgment

The statistics on alcohol-attributable mortality and burden of disease follow our chapter in the publication "Alcohol in the European Union: Consumption, Harm and Policy Approaches" of the WHO Regional Office for Europe.[29] We would like to acknowledge the financial support of the WHO Regional Office for Europe, and its provision of data from the latest survey on alcohol consumption and policy for all member states.

Relationships between alcohol, disease and injury

Alcohol is an essential cause of many categories of diseases that are 100% attributable to alcohol. While Alcohol Use Disorders (AUDs)—that is, AD, and the harmful use of alcohol as defined by ICD-10—are certainly the most important, they are far from being the only ones. Rehm and colleagues listed more than 40 such conditions recorded in the ICD-10, ranging from chronic diseases (e.g. K70, alcoholic liver disease; or K86.0, alcohol-induced chronic pancreatitis), to injuries (e.g. X45, accidental poisoning by and exposure to alcohol), to the drinking of a pregnant woman harming her unborn child (e.g. Q86.0, foetal alcohol syndrome).[8] However, there are even more conditions where alcohol is a component cause:[45] not all are caused by alcohol, but in certain cases alcohol is a causal factor. In the example of traffic injury mortality, there are many influencing factors, such as road conditions, traffic density, or the use or non-use of seat belts. In a certain percentage of these, alcohol is a causal factor—without alcohol consumption, the deaths would not have happened.

Methodology for deriving the alcohol-attributable burden

Web Appendix 2 describes in detail the methodologies used to determine what proportions of disease and injury were caused by alcohol (= alcohol-attributable fractions). First, we would like to introduce these estimates. To predict the alcohol-attributable burden, two factors were used: average volume of alcohol consumption, and patterns of drinking. For the first example, alcohol-attributable cancers, only volume is important (see the graphic below). The risk relation is quite simple: the more alcohol consumed, the higher the risk for cancer. So calculating the proportion of a given form of cancer caused by alcohol requires this information: the proportion of drinkers in the population under consideration, the distribution of how much alcohol they consume, and the risks associated with different volumes of drinking. The distributions and associated risks for each level of drinking are combined multiplicatively to derive the attributable fraction (see Web Appendix 2). Thus, the more people who consume alcohol, the higher the level of alcohol consumption among these drinkers, and the higher the risk for a specific cancer associated with a given level of drinking, then the higher the proportion of this cancer attributable to alcohol. This is a simplified explanation, as the actual calculations are more complicated; for one thing, they are done separately by sex and age groups. As well, the calculations take other factors into consideration. One such is the proportion of ex-drinkers: some people quit drinking for health reasons, but still have a higher risk for alcohol-related diseases than lifetime abstainers.[40]

Other disease outcomes are more complex than cancer, as the risk relations are not always direct. In the case of ischemic heart disease, light and moderate drinking leads to a decrease in risk compared to lifetime abstention—but only if this average drinking frequency is not coupled with occasional heavy drinking[35;46-48] (see also Web Appendix 3). Heavy average drinking leads to an increase in heart disease. So the formula has to take into consideration not only the average volume of drinking, but also the risks associated with irregular heavy drinking (for details, see Web Appendix 2). And the relationship of injuries to alcohol is another complicated one, as it depends on the concentration of blood alcohol and associated risks. The graphic below provides an overview of the disease and injury conditions for which alcohol is determined to be causal, and of the conditions we were able to model for which data were available.[40]

Alcohol-attributable disease and injury GBD 2005/2010 (green mainly protective)

Chronic and infectious disease:

- **Cancer:** nasopharyngeal cancer, esophageal cancer, laryngeal cancer, liver cancer, colon/rectal cancer, female breast cancer
- **Neuropsychiatric diseases:** alcohol use disorders (100% alcohol attributable), primary epilepsy
- Diabetes
- **Cardiovascular diseases:** hypertensive diseases, ischemic heart disease, ischemic stroke, hemorrhagic stroke, atrial fibrillation and flutter
- **Gastrointestinal diseases:** liver cirrhosis, pancreatitis
- **Infectious diseases:** tuberculosis, effect of alcohol on course of HIV/AIDS, lower respiratory infections (pneumonia)
- **Conditions arising during perinatal period:** Low birth weight, fetal alcohol syndrome FAS (100% alcohol attributable)

Injury:

- **Unintentional injury:** transport injuries, falls, drowning, fire, poisonings, exposure to forces of nature, other unintentional injuries
- **Intentional injury:** Self-inflicted injuries, interpersonal violence, other intentional injuries

The problem of time lag

In most analyses of alcohol-attributable burden, the calculations are conducted as if the health consequences of alcohol consumption are immediate. On an epidemiological level, this may be partially true for most of the alcohol-attributable health burden: even the effects of alcohol consumption on chronic diseases such as cirrhosis can be seen immediately at the population level.[9;49;50] (For a general discussion of this, see references 51-52.) However, cancer is different. The effect of alcohol consumption on cancer can only be seen after many years, often as long as two decades. However, for the purpose of illustrating the entire alcohol-attributable burden, it is important to include cancer deaths—especially since in Europe, a recent large study found that 1 in 10 cancers in men, and 1 in 33 cancers in women, were alcohol-related.[53] So in this chapter's interpretation of alcohol's effect on mortality and disease, it should be kept in mind that the calculations assume uniform exposure to alcohol for at least the previous two decades.

Alcohol-attributable mortality

This section provides an overview of alcohol-attributable mortality, showing both the number of actual deaths and the Potential Years of Life Lost (PYLL) due to premature mortality. As in the rest of this report, we focus on the 15–64 age range. One reason for this is that death certificates become more problematic for older ages,[54] especially for the very old.[55] As well, Relative Risks (RRs) for alcohol-attributable causes also tend to go down with age,[56] meaning that the consequences of consumption (both detrimental and beneficial) tend to be exaggerated in the older age group. However, age-specific RRs are not available for most alcohol-attributable disease categories. This section also excludes under-15 year-olds, since alcohol-attributable deaths in this age group are very rare. The exceptions are deaths as the result of someone else's drinking, such as traffic fatalities caused by drunk drivers. These are reported in the section "Health harms to others due to alcohol consumption."

In the following section, all graphs separate the four regions by colour coding, based on their average volume and patterns of drinking:

Colour Codes for EU Regions and Countries

The European Union (total 27 countries): blue

Central-East and Eastern Europe (10 countries): Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia: red

Nordic Countries (5 countries): Denmark, Finland, *Iceland, Norway*, Sweden: grey

Central-West and Western Europe (9 countries): Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, *Switzerland*, UK: yellow

Southern Europe (6 countries): Cyprus, Greece, Italy, Malta, Spain, Portugal: light grey

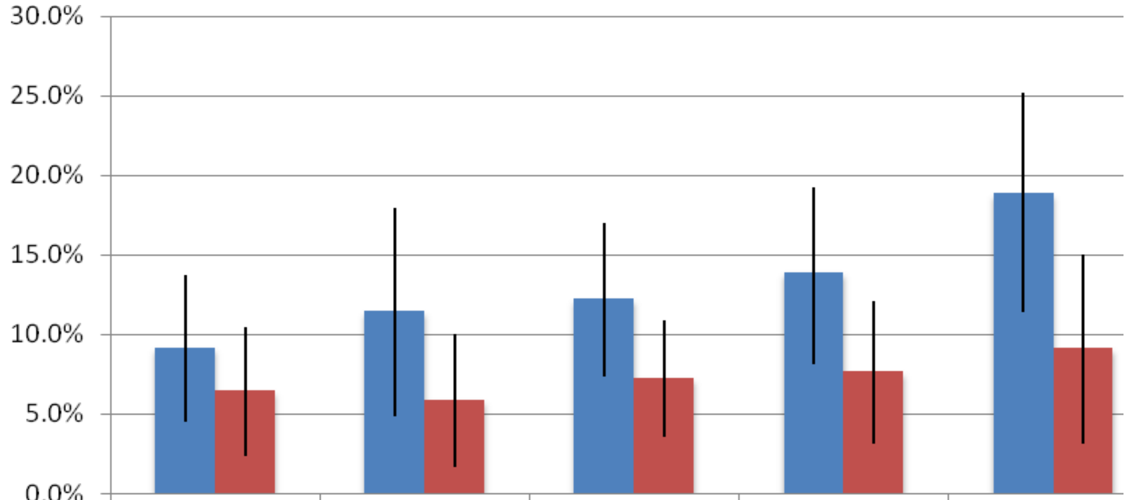
(Note that the italicized countries—Iceland, Norway and Switzerland—are not EU member states; they are included only for comparison.)

Deaths due to alcohol consumption

In terms of overall deaths for men and women aged 15–64 in the EU in 2004, we estimated that 94,451 (95% Confidence Interval–CI: 55,376 to 130,712) men and 25,284 (95% CI: 10,390 to 39,973) women died of alcohol-attributable causes (total 119,735 (95% CI: 65,766 to 170,685)). This corresponds to 13.9% (95% CI: 8.1% to 19.2%) of all deaths in men in this age category; 7.7% (95% CI: 3.1% to 12.1%) of all deaths in women; and 11.9% (95% CI: 6.5% to 16.9%) of all deaths. (Figures 4 and 5 provide an overview of details by region and country.) The proportions of alcohol-attributable deaths to all deaths show some variation, as seen in Figure 4. The toll of 11.9% mortality caused by alcohol signals a high level of overall burden. Even in the region with the lowest burden, Southern Europe, about 9.2% (95% CI: 4.5% to 13.7%) and 6.4% (95% CI: 2.4% to 10.5%) of all deaths in men and women respectively are due to alcohol. This means that even in the least-affected region, more than 1 in every 11 male deaths, and 1 in every 16 female deaths, is still due to alcohol.

Figure 4: Regional variations in proportions of deaths

The figure below indicates the regional variations in the proportions of alcohol-attributable deaths to all deaths, for people aged 15–64 living in the EU in 2004.



	Southern Europe	Nordic countries	Central West and Western Europe	European Union	Central-East and Eastern Europe
Men	9.2%	11.5%	12.2%	13.9%	18.9%
Women	6.5%	5.9%	7.2%	7.7%	9.1%

■ Men ■ Women

In interpreting these figures, we should keep in mind that alcohol-attributable mortality and burden of disease are determined by four factors (see Web Appendix 2 for a formal description of the underlying methods and formulas):

- the level and pattern of alcohol consumption;
- the risk relations between alcohol consumption and various causes of death;
- the distribution of causes of death;
- the economic wealth of a country.

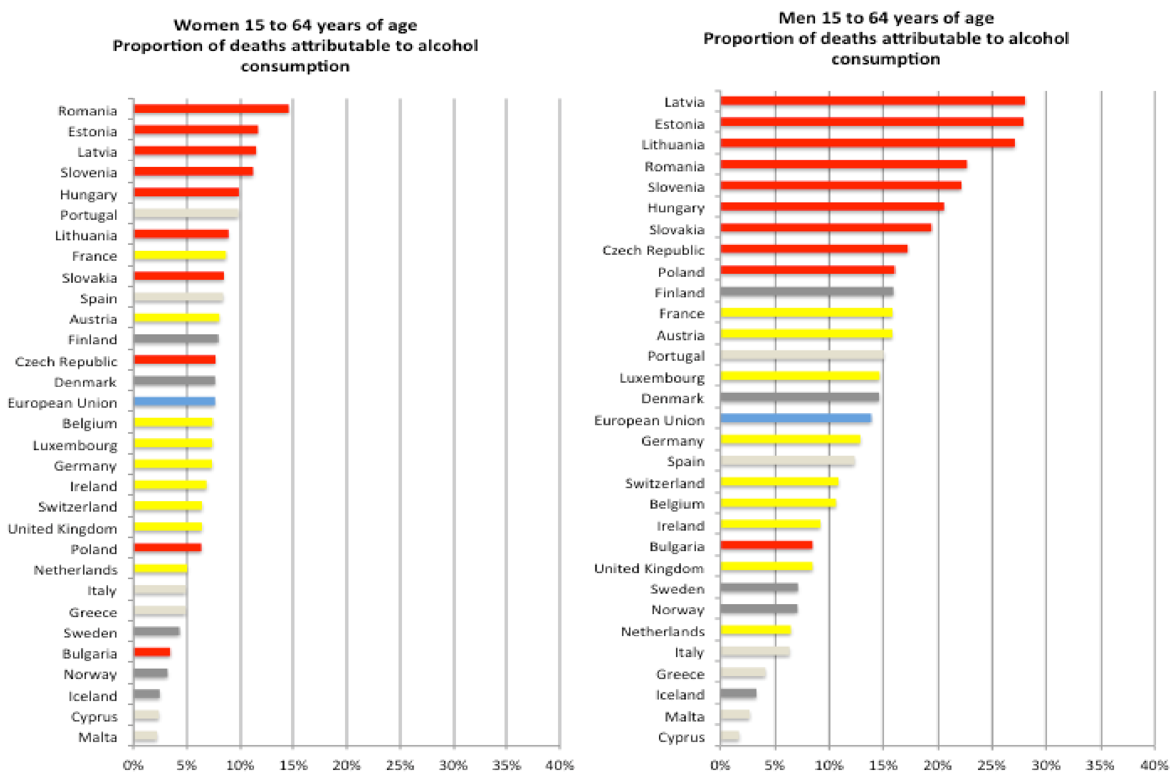
The last factor, economic wealth, is important, as research has shown that the same quantity of alcohol, consumed in the same pattern, produces more harm in poorer countries than in richer countries.[2;57] This factor also contributes to the higher alcohol-attributable mortality burden in the Central-East and Eastern European countries, as this region is poorer than the other three regions. (In 2005, the Gross Domestic Product adjusted for Purchase Price Parity—known as the GDP-PPP—per capita for this region was less than half the EU average.) In the Central-East and Eastern Europe region, several countries—Bulgaria, the Baltic countries, the Czech Republic, Poland, Romania, Slovakia and Slovenia—have been classified as upper-middle income for most of the past decade. In the most recent classification, however, only four countries (Bulgaria, Latvia, Lithuania and Romania) remained in this category.[v]

Figure 5, below, provides an overview of the proportions of alcohol-attributable deaths at the country level; while Web Appendices 4 and 5 provide the CIs for these estimates at a country level, and also give the standardized rates of alcohol-attributable deaths.

v See online: http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Upper_middle_income.)

Figure 5: Country variations in the proportions of deaths

The figure below indicates the variations, by country, of the proportions of alcohol-attributable deaths to all deaths, for people aged 15–64 living in the EU in 2004.



The separation between regions is quite clear, especially for men. However, different countries ranked highest within Central-East and Eastern Europe by gender. In the Baltic countries of Estonia and Lithuania, more than 25% of male deaths were attributable to alcohol; whereas for women, Romania bore the highest burden. At the other end of the spectrum, the small islands of Cyprus, Iceland and Malta displayed the lowest burden of alcohol-attributable mortality, for both sexes.

Thus far, we have only considered alcohol-attributable deaths as a proportion of mortality from all causes. Moving on to broad disease categories, Table 4 provides an overview of alcohol-attributable deaths, separating detrimental and protective influences. The distribution varies markedly by sex and region (regional differences are outlined in more detail in Web Appendix 9). For men, liver cirrhosis (26%) and unintentional injury (23%) contributed the most to alcohol-attributable mortality, followed by cancer (16%) and intentional injury (15%). For women, liver cirrhosis (37%) and cancer (31%) made up almost 70% of the alcohol-attributable deaths, with cardiovascular disease (CVD) other than ischemic heart disease (IHD) a distant third (11%). The beneficial effects of alcohol consumption in terms of mortality were primarily observed with respect to IHD in men (98%); in contrast, some 33% of these beneficial effects in women were observed in other disease categories (including diabetes, but mainly CVD (other than IHD), hypertensive diseases, and ischemic stroke).

Table 4: Deaths by disease categories

The table below indicates the prevalence of alcohol-attributable deaths by broad disease categories, for people aged 15–64 living in the EU in 2004.

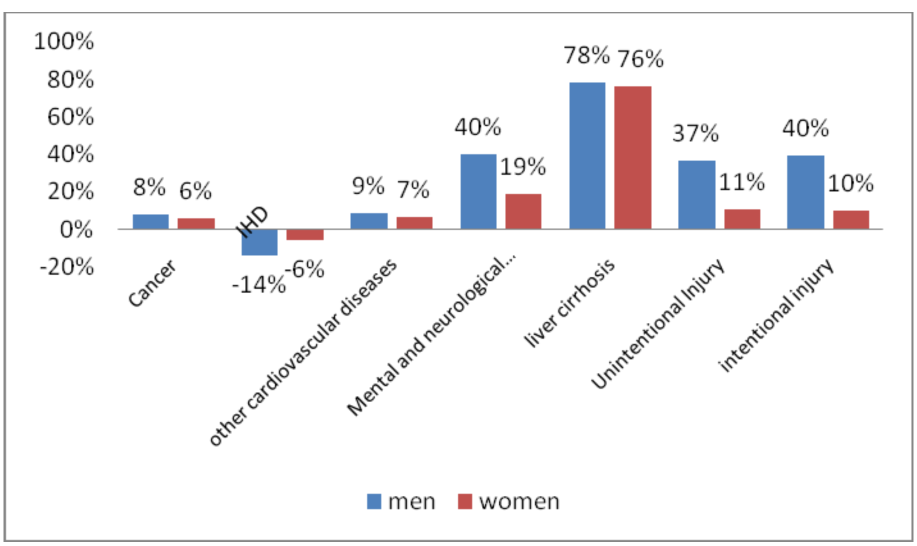
Detrimental effects	**Men #s**	**Women #s**	**Men %**	**Women %**
Cancer	17,358	8,668	15.9%	30.7%
CVD (other than IHD)	7,914	3,127	7.2%	11.1%
Mental and neurological disorders	10,868	2,330	9.9%	8.3%
Liver cirrhosis	28,449	10,508	26.0%	37.2%
Unintentional injury	24,912	1,795	22.8%	6.4%
Intentional injury	16,562	1,167	15.1%	4.1%
Other detrimental	3,455	637	3.2%	2.3%
Total detrimental	109,517	28,232	100.0%	100.0%
Beneficial effects				
IHD	14,736	1,800	97.8%	61.1%
Other beneficial	330	1,147	2.2%	38.9%
Total beneficial	15,065	2,947	100.0%	100.0%

In all regions, men's alcohol-attributable deaths were distributed more evenly across disease categories than women's. For men, no category in any region included more than 33% of all deaths; whereas for women, the top two disease categories (cancer and liver cirrhosis) in all regions were above 60%, and over 70% in two of the four regions.

The mortality figures showed considerable variation between regions. Two causes—injuries, and CVD (other than IHD)—were proportionally higher in Central-East and Eastern Europe, which reflected that region's combination of high consumption coupled with irregular heavy drinking.[41;58] Mental and neurological disorders were proportionally higher in Nordic countries, reflecting the relatively high prevalence of AD and AUD in that region (see Figure 6, below). Cancer was proportionally higher in Southern Europe, reflecting the much higher levels of consumption two decades ago[24] (see reference 59 for more details). As indicated above, cancer takes a long time to develop. The category with the most similar relative proportion across all regions was liver cirrhosis, which varied between 23.3% and 28.4% for men, and 31.0% and 39.9% for women. Figure 6, below, provides an overview of the proportions of alcohol-attributable disease categories.

Figure 6: Proportion of deaths for major disease categories

The figure below indicates the proportion of alcohol-attributable deaths for the major disease categories, for people aged 15–64 living in the EU in 2004.



In terms of the largest category, liver cirrhosis, alcohol caused between 75% and 80% of cases. This can be attributed to a relatively low prevalence of other risk factors for this disease in Europe; as a consequence, trends in liver cirrhosis mortality rates closely followed trends in alcohol consumption. (See reference 50 for a general overview, and reference 60 for an example in Britain.) As described in Web Appendix 3, alcohol-attributable proportions were estimated using Alcohol-Attributable Fractions (AAFs) for all liver cirrhosis. These were based on exposure and the RR,[61] rather than on cause-of-death records indicating alcoholic liver cirrhosis. There are two reasons for this procedure. One is that death certificates often underestimate[62-63] the proportion of liver cirrhosis attributable to alcohol for a number of reasons, such as social stigma or potential insurance problems. Second, it has long been recognized that when death certificates indicate detailed "cause of death" categories, there is often a high degree of misclassification. The combination of these two factors means that the misclassification associated with the "combined" category of liver cirrhosis should be smaller than the misclassification for the different subcategories of the disease, such as alcoholic liver cirrhosis.

With respect to proportions of the other diseases, we observed a marked impact of alcohol consumption on cancer mortality, which is in line with the results of other studies. These include the largest cohort study on alcohol and cancer in the EU.[53] We observed large detrimental effects of alcohol consumption on both mortality from CVD (other than heart disease, for which we observed an overall cardioprotective effect; see reference 47-48) and injury (both unintentional and intentional). The effect on mental health and neurological disorders was due mainly to AD, which was more prevalent in Europe than in most other parts of the world.[2;64]

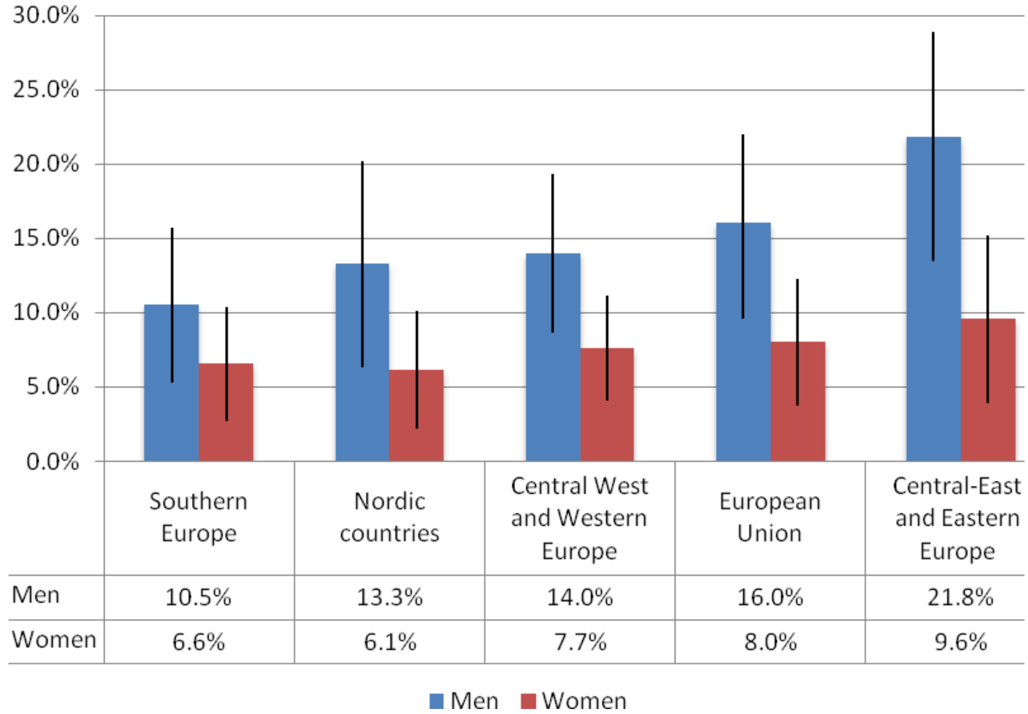
There was a very high congruence of alcohol-attributable mortality between European regions, with the exception of ischemic heart disease (IHD), where we observed less cardioprotection, in both men and women, in the Central-East and Eastern regions compared to other regions.[6;65-66] This difference could be explained by data on levels and patterns of drinking in this region, and by the higher frequency of heavy drinking occasions.[67] Consistent with this explanation, the cardioprotective effect of alcohol consumption disappeared almost completely in Russia, where the net effect was highly detrimental.[9] Another observed difference was the lower proportion of alcohol-attributable deaths from mental health and neurological disorders in Southern European men. This was due to the lower number of individuals with AD in this region (see section on AD below for further explanation). Finally, the rate of alcohol-attributable injury was higher in Central-East and Eastern European regions (see also reference 67).

Potential Years of Life Lost (PYLL) due to alcohol

Another important measure involving mortality is Potential Years of Life Lost (PYLL)—a measure of premature mortality that attempts to estimate the length of time a person would have lived if he or she had not died early. This alternative method to using the number of deaths (or death rates) gives more weight to deaths that occur among younger people. Overall, we estimated that in the EU in 2004, 1,684,000 (95% CI: 1,009,000 to 2,310,000) PYLL in men, and 408,000 (95% CI: 190,000 to 624,000) PYLL in women, were due to alcohol consumption (total 2,092,000 (95% CI: 1,199,000 to 2,934,000)). This corresponded to 16.0% (95%CI: 9.6% to 22.0%) of all PYLL in men, and 8.0% (95% CI: 3.7% to 12.2%) of all PYLL in women (13.4% (95% CI: 7.7% to 18.8% of all PYLL). The slightly higher proportion of alcohol-attributable PYLL compared to deaths indicates that these fatalities occur, on average, earlier than other fatalities. Figure 7 provides details of the proportions of all PYLL by region. Again, the Central-East and Eastern European region had the most premature mortality, and the rank order is the same as for deaths (see Figure 4, above).

Figure 7: Regional variations in the proportion of PYLL

The figure below indicates the regional variations in the proportion of alcohol-attributable PYLL to all PYLL, for people aged 15–64 living in the EU in 2004.

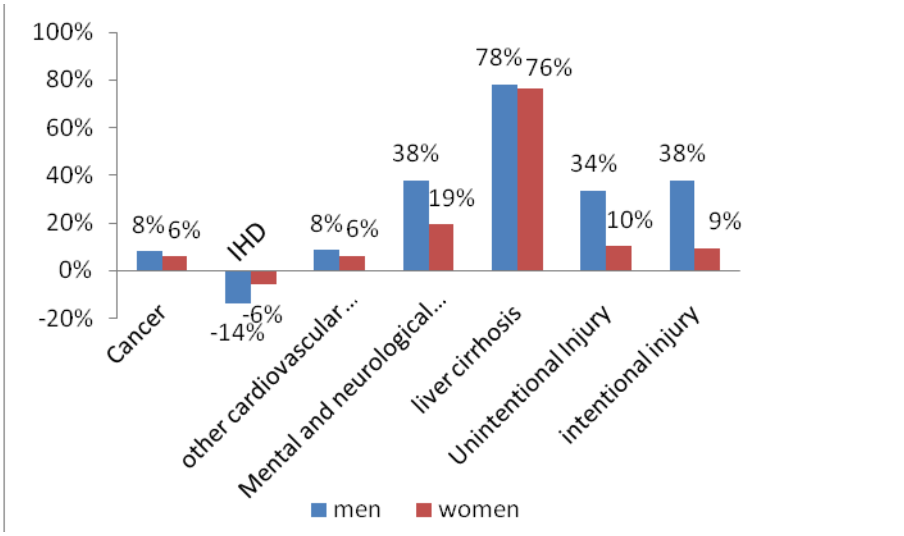


	Southern Europe	Nordic countries	Central West and Western Europe	European Union	Central-East and Eastern Europe
Men	10.5%	13.3%	14.0%	16.0%	21.8%
Women	6.6%	6.1%	7.7%	8.0%	9.6%

The remaining statistics for PYLL also look fairly similar to the respective statistics for deaths, but with slightly more variation at the regional level, and between countries. (See Web Appendix 6 for estimates and CIs of PYLL at the country level.)

Figure 8: Proportion of PYLL for major disease categories

The figure below indicates the proportion of alcohol-attributable PYLL for the major disease categories, for people aged 15–64 living in the EU in 2004.



Alcohol-attributable disability and burden of disease

Years of Life Lost Due to Disability (YLD)

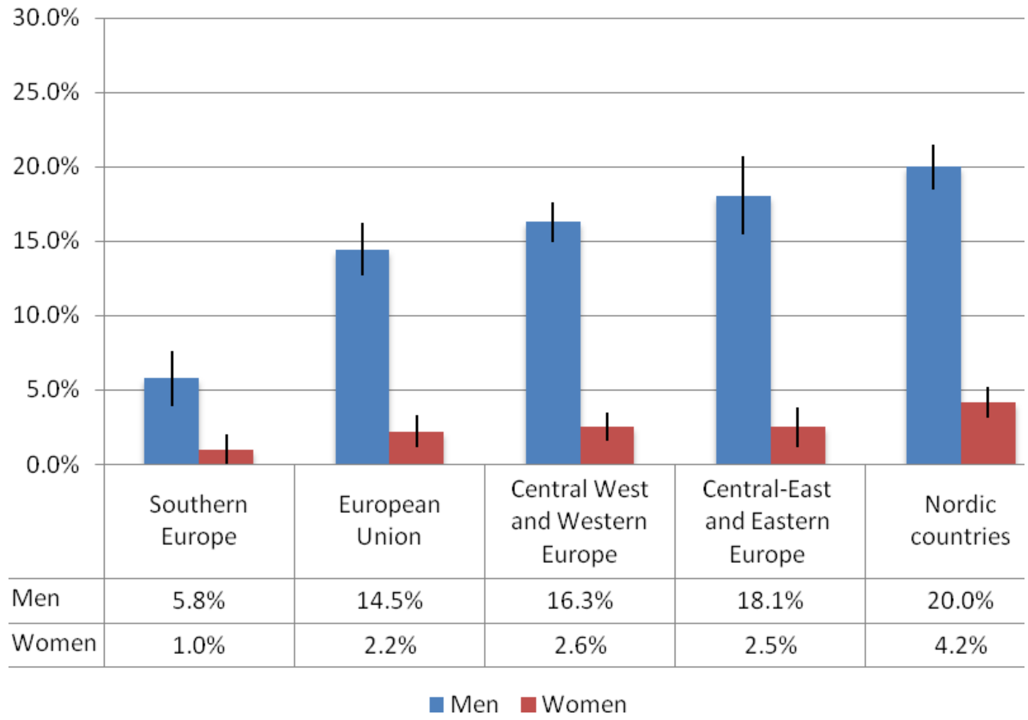
The next measure of health to be reported is Years of Life Lost Due to Disability (YLD), which measures time lost due to disability. To calculate this indicator, one needs (in addition to data on average duration) a specific disability weight for each health condition, denoting the proportion of detriment it causes. For example, a certain condition, such as profound deafness, may be 30% disabling (see reference 68 for further explanation).

Overall, in the EU in 2004, 1,675,000 (95% CI: 1,467,000 to 1,881,000) YLD in men, and 276,000 (95% CI: 140,000 to 407,000) YLD in women, were lost to alcohol-attributable causes (total of 1,951,000 (95% CI: 1,607,000 to 2,288,000 YLD)). This corresponds to 14.5% (95% CI: 12.7% to 16.2%) of all YLD in men, and 2.2% (95% CI: 1.1% to 3.3%) of all YLD in women (8.1% (95% CI: 6.7% to 9.5% of all YLD)).

In terms of disability-causing diseases, AUDs contributed proportionally more to disability (as measured by YLD) than to mortality: this category of disease is more disabling than lethal. This means that countries with a higher incidence of AUDs have a larger proportion of alcohol-attributable YLD to all YLD. This is especially relevant for Nordic countries, which have a proportionally high level of AUD compared to their drinking volume (see Figure 7; see Web Appendix 7 for estimates and CIs of YLD at a country level[69]). The proportions of alcohol-attributable YLD were not perfectly associated with absolute rates of YLD. Central-East and Eastern European countries had the highest rates of alcohol-attributable YLD, despite not having the largest proportion of alcohol-attributable YLD to all YLD for men.

Figure 9: Alcohol-attributable YLD to all YLD, by region

The figure below indicates the regional variations in the proportion of alcohol-attributable YLD to all YLD, for people aged 15–64 living in the EU in 2004.



	Southern Europe	European Union	Central West and Western Europe	Central-East and Eastern Europe	Nordic countries
Men	5.8%	14.5%	16.3%	18.1%	20.0%
Women	1.0%	2.2%	2.6%	2.5%	4.2%

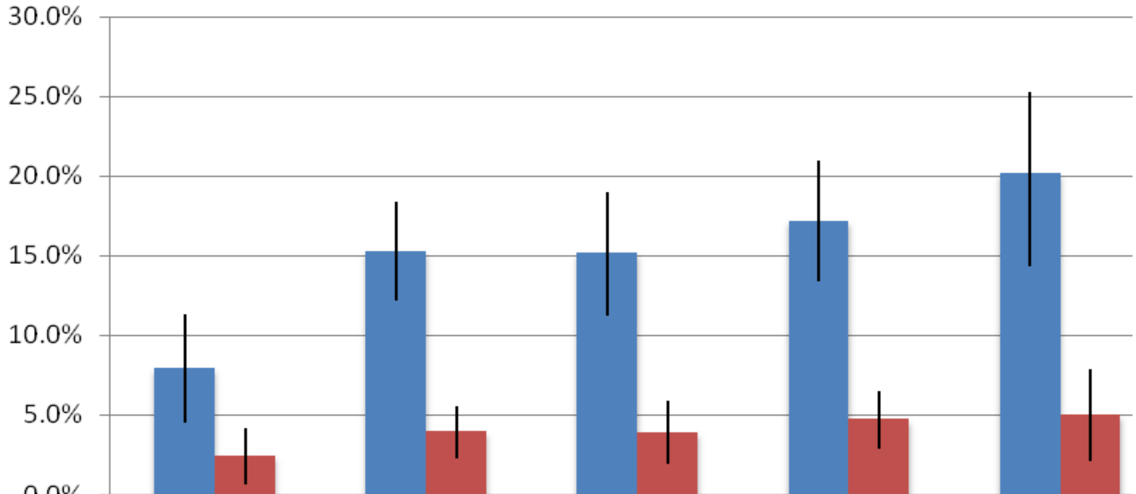
Burden of disease due to alcohol

Disability-Adjusted Life Years (DALYs) are a summary measure of health that add together PYLL and YLD to create a measure of all years of life lost due either to premature mortality, or to living with a disability. DALYs have become the most-used indicator for comparing health across different jurisdictions. They are used by the WHO for its regular health monitoring, by the World Bank, and by scientific studies such as the GBD.

We estimated that in 2004 in the EU, 3,359,000 (95% CI: 2,477,000 to 4,191,000) DALYs in men, and 684,000 (95% CI: 330,000 to 1,030,000) DALYs in women, were lost due to alcohol-attributable causes (total 4,043,000 (95% CI: 2,807,000 to 5,221,000)). This corresponded to 15.2% (95% CI: 11.2% to 19.0%) of all DALYs in men, 3.9% (95% CI: 1.9% to 5.9%) of all DALYs in women, and 10.2% (95% CI: 7.1% to 13.2%) of all DALYs. The following graphics, Figures 10 and 11, provide an overview of details by region and country.

Figure 10: Alcohol-attributable DALYs to all DALYs, by region

The figure below indicates the regional variation in the proportion of alcohol-attributable DALYs to all DALYs, for people aged 15–64 living in the EU in 2004.



	Southern Europe	Central West and Western Europe	European Union	Nordic countries	Central-East and Eastern Europe
Men	7.9%	15.3%	15.2%	17.2%	20.2%
Women	2.4%	4.0%	3.9%	4.7%	5.0%

■ Men ■ Women

The difference is more than double between the region with the lowest proportions of alcohol-attributable DALYs in both sexes (Southern Europe: men 7.9% (95% CI: 4.5% to 11.3%); women: 2.4% (95% CI: 0.6% to 4.2%)), and the region with the highest (Central-East and Eastern Europe: men 20.2% (95% CI: 14.3% to 25.3%); women: 5.0% (95% CI: 2.1% to 7.9%)). Nordic countries showed overall higher rates of alcohol-attributable DALYs, due to their relatively higher (compared to other European regions) YLD (see Figure 10, above). For both men and women, proportions of alcohol-attributable DALYs in the Nordic countries were above the EU average. This observation fits well with the results of time-series modelling, in which the effects of “alcohol per unit consumed” were higher in the Nordic countries than in the Central-West and Western countries, as well as the Southern countries. (The Central-East and Eastern countries were not included in previous analyses, as outlined in reference 70, mainly due to alcohol’s effects on rates of injury, both intentional and unintentional.[71-73])

A look at individual countries revealed greater variation, though most variation still occurred between regions. For Central-East and Eastern Europe (the region with the highest alcohol-attributable burden of disease), Bulgaria had the lowest burden for both men and women (See Figure 11; for CIs, see Web Appendix 8). Nordic countries displayed the greatest variation within a region, with Sweden and Norway among the countries with the highest proportion of disease for women, and Iceland with one of the lowest. For men, Norway and Finland were among the countries with the highest proportion of disease; Iceland, again, had one of the lowest. Countries from Central-West and Western Europe all clustered around the EU mean, and the Southern European countries were all among those with the lower burdens (see Figure 11, next page).

Figure 11: Proportion of alcohol-attributable DALYs to all DALYs

The figure below indicates the variation of the proportion of alcohol-attributable DALYs to all DALYs, by country, for men and women aged 15–64 living in the EU in 2004.

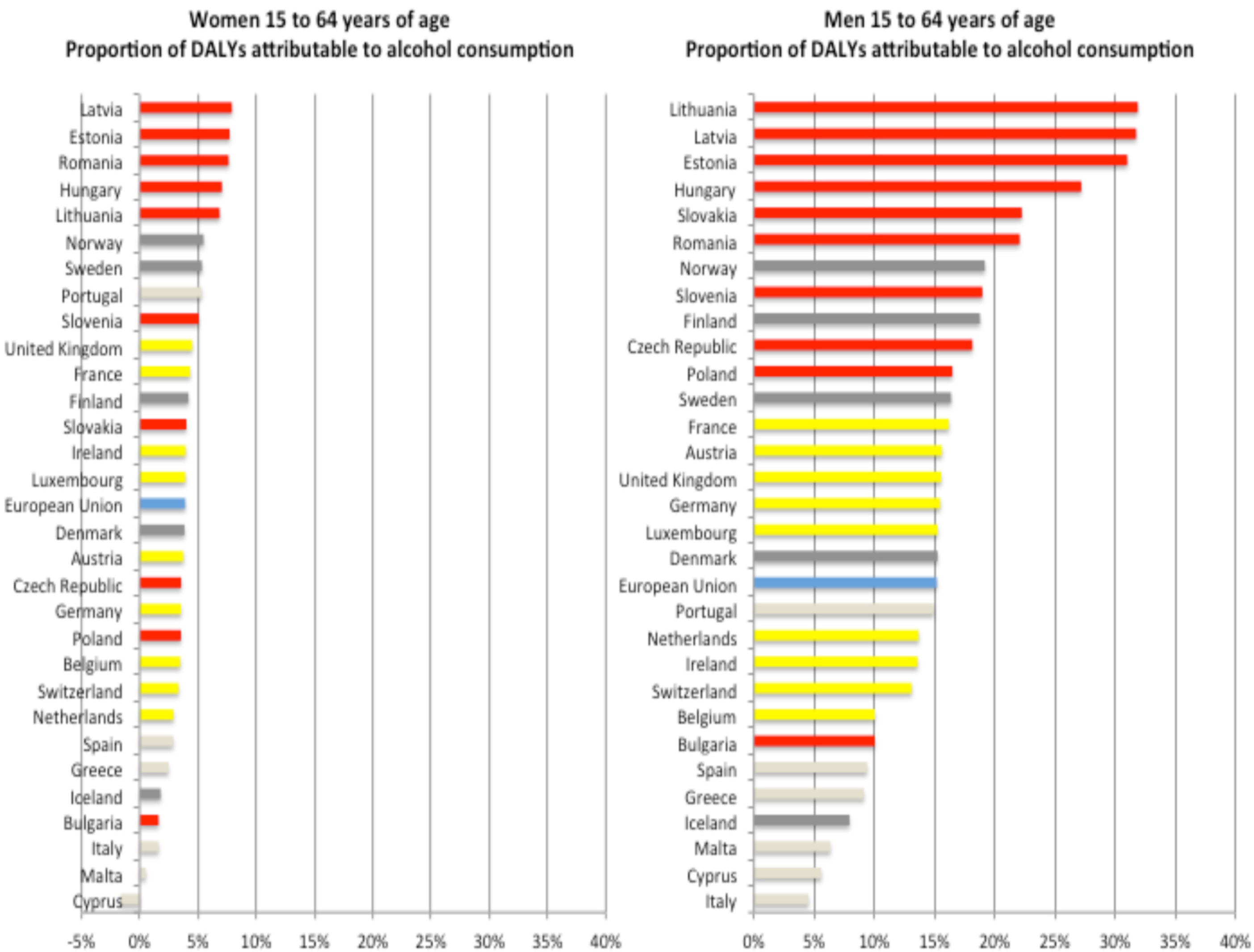


Table 5: Alcohol-attributable DALYs by disease categories

The tables below indicate the alcohol-attributable burden of disease in DALYs, by broad disease categories, for people aged 15–64 living in the EU in 2004.

Detrimental effects	**Men**	**Women**	**Men**	**Women**
Cancer	251,891	151,671	6.9%	17.5%
CVD (other than IHD)	128,336	25,969	3.5%	3.0%
Mental and neurological disorders	1,691,310	382,584	46.3%	44.2%
Liver cirrhosis	512,560	212,676	14.0%	24.6%
Unintentional Injury	634,959	50,936	17.4%	5.9%
Intentional injury	347,225	24,147	9.5%	2.8%
Other detrimental	83,640	18,149	2.3%	2.1%
Total detrimental	3,649,921	866,131	100.00%	100.00%
Beneficial effects				
IHD	275,588	87,887	94.8%	48.3%
Other beneficial	15,049	94,054	5.2%	51.7%
Total beneficial	290,637	181,941	100.0%	100.0%

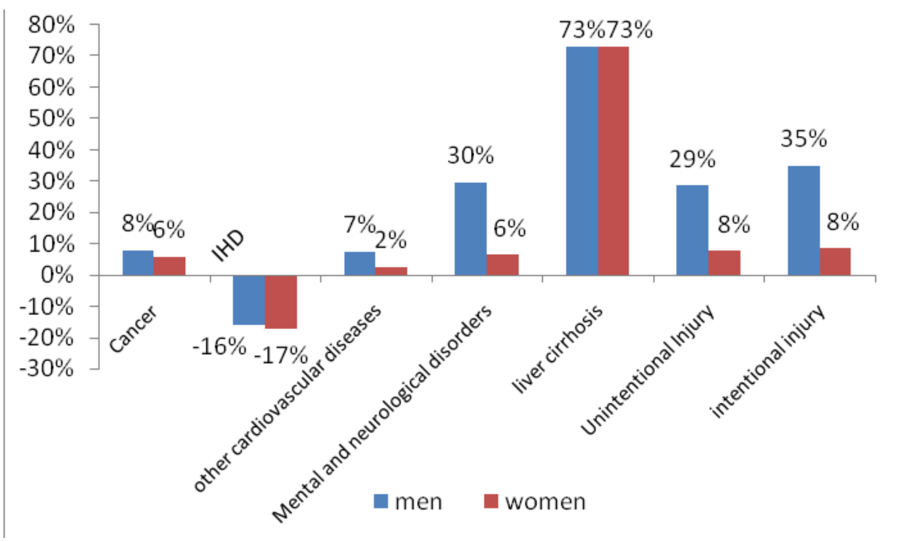
Table 5 provides an overview of the main causes of the alcohol-attributable burden of disease, which are markedly different from the main causes of mortality. Mental and neurological disorders comprised the largest proportion of disease (as measured in DALYs) for both men (46%) and women (44%). For men, injuries were the second-largest contributors (unintentional 17%; intentional 10%), whereas for women liver cirrhosis was the second-largest contributor (25%). The high burden of mental and neurological disorders was almost entirely due to AUD, especially AD. AD was less fatal than other diseases such as cancer and CVD, and so contributed relatively more to the disease burden than to mortality. (Web Appendix 10 outlines the main causes of disease in DALYs by broad disease categories, by sex and by region.)

Most regional differences in the proportional composition of the burden of disease were similar to the differences observed for deaths (see also the more detailed explanation above following Table 4). The major differences were that two categories, injury and CVD (other than

IHD), were both proportionally highest in Central-East and Eastern Europe. The biggest differences between regions were observed for mental and neurological disorders, which comprised approximately two-thirds of all alcohol-attributable DALYs for the Nordic countries; about half for Central-West and Western Europe; slightly more than one-third for Central-East and Eastern European countries; and about one-third for the Southern European countries. Overall, it was observed that the proportions of alcohol-attributable DALYs to all DALYs within the major disease categories were relatively similar to the respective proportions for mortality.

Figure 12: Proportions of alcohol-attributable burden of disease in DALYs

The figure below indicates the proportions of the burden of alcohol-attributable disease in DALYs, by disease categories, for people aged 15–64 living in the EU in 2004.



Health harms to others due to alcohol consumption

Thus far we have discussed the effects of alcohol consumption in terms of disease and mortality affecting the drinkers themselves. However, drinkers not only endanger their own health, but also the health of others. This section will describe the major harms to others due to alcohol consumption. The victims of these damages are people who may or may not drink themselves, but are affected by other people's drinking. This category includes three major items, with greatly different prevalence rates. The largest is transport injuries: passengers or other drivers who are injured or killed by drunk drivers. This is the main cause of harms to others, with the next item coming a distant second: physical violence or homicide engaged in by individuals under the influence of alcohol. (This report focuses solely on the drinking of the persons responsible for assault. Although it is true that people who drink do increase their own probability of being assaulted, we only calculated mortality and morbidity based on the drinking of others.) Finally, babies born with low birth weight due to the mother's drinking account for a small but significant proportion of harms to others.

One way in which this section differs from our main analysis of alcohol-related harms is that it includes all age groups. The category of "harms to others" affects people of all ages, and so this particular analysis is not restricted to people 15–64 years of age.

In the EU in 2004, for men of all ages, the harms to others caused by alcohol consumption included 5,564 deaths, 139,824 PYLL, 18,987 YLD, and 158,811 DALYs—all estimated to be attributable to drinking. For women of all ages, the analogous figures were 2,146 deaths, 51,326 PYLL, 8,423 YLD and 59,749 DALYs. For both sexes, the totals were 7,710 deaths, 191,151 PYLL, 27,410 YLD, and 218,560 DALYs (see Web Appendix 11 for more details, including CIs). Table 6 outlines the alcohol-attributable burden caused by harms to others.

Our findings on the proportions of the three main categories of alcohol-attributable harms to others—transport injuries, violence, and low birth weight in babies—were similar to those observed in an Australian study in 2005. In that case, a total of 367 people died due to alcohol consumption by others: 75.4% from motor-vehicle accidents, 21.0% from assaults, and 3.6% from fetal alcohol syndrome (FAS), which includes low birth weight.[74] (The mortality percentages for FAS were higher in Australia than the low birth weight mortality percentages in the EU. This is because the FAS data from Australia included other causes of death and disability that are not included in this report, due to the limitations of mortality data on an international level.)

Table 6: Alcohol-attributable mortality and disease caused by harms to others

The table below indicates the alcohol-attributable mortality and burden of disease caused by harms to others, for people aged 15–64 living in the EU in 2004.

Health Burden	**Numbers**			**Percentage of total**	
Deaths	**Men**	**Women**		**Men**	**Women**
Low birth weight	62	45		1.1%	2.1%
Violence	1,586	685		28.5%	31.9%
Transport injuries	3,916	1,416		70.4%	66.0%
Total	5,564	2,147		100.0%	100.0%
DALYs					
Low birth weight	2,685	2,063		1.7%	3.5%
Violence	47,956	18,967		30.2%	31.7%
Transport injuries	108,170	38,719		68.1%	64.8%
Total	158,811	59,749		100.0%	100.0%

In terms of deaths caused by harms to others in 2004, men had a lower percentage than women across the EU—with the exception of Southern Europe. Of the total alcohol burden measured in deaths, the numbers for alcohol-attributable harms to others were 3.3% for both sexes (3.1% for men; 3.8% for women); and measured in DALYs, 4.5% for both sexes (4.0% for men; 6.9% for women).

The Contribution of Heavy Drinking

> Our research found that heavy drinking—defined as consuming, on average, at least five standard drinks of pure alcohol a day for men, and at least three for women—caused most of the alcohol-attributable burden in 2004. In terms of DALYs, 89% were attributable to heavy drinking; and in terms of deaths, 77.3% were alcohol-attributable. This worked out to a total of 92,600 deaths: 75,200 among men, and 17,400 among women. Reducing the incidence of heavy drinking is the key to reducing the health toll on society in the EU.

"Heavy drinking" in men is defined as consuming 60+ g of pure alcohol per day (the equivalent of at least 5 standard drinks of 12 g pure alcohol); and in women as consuming 40+ g (equal to at least 3.33 standard drinks). This corresponds to the categories defined as "high risk/very high risk" by the European Medicines Agency, based on WHO guidelines.[25] Heavy drinking is considered to be responsible for a large proportion of the alcohol-attributable burden of disease among EU residents aged 15 to 64. Table 7, below, outlines the relative alcohol-attributable mortality and burden of disease caused in 2004 by heavy drinking.

We estimated that more men than women were heavy drinkers (see Table 1), and so we expected that heavy drinking would cause relatively more harm to men than women. Indeed, based on the 2004 data, heavy drinking in men was responsible for 11.1% of all deaths, 68.7% of harmful alcohol-attributable deaths, and 79.6% of net alcohol-attributable deaths (for a total of 75,200 male deaths). In contrast, among women heavy drinking was responsible for 5.3% of all deaths, 61.6% of harmful alcohol-attributable deaths, and 68.8% of net alcohol-attributable deaths (for a total of 17,400 female deaths). These figures show that in terms of all deaths, the harmful effects of heavy drinking on men are roughly double those on women.

Similarly, in terms of DALYs, heavy drinking had more of an impact on men's than it did on women's. We estimated that among men, heavy drinking was responsible for 13.3% of all DALYs, 80.5% of harmful alcohol-attributable DALYs, and 87.4% of net alcohol-attributable DALYs. For women, we estimated a smaller relative burden—heavy drinking was responsible for 3.8% of all DALYs, and 76.4% of harmful alcohol-attributable DALYs. However, there was a larger relative burden for net alcohol-attributable DALYs: heavy drinking was responsible for 96.7%. Table 7, below, breaks down the numbers by category, sex, and age range.

Table 7: Alcohol-attributable mortality and disease

The table below indicates the alcohol-attributable mortality and burden of disease caused by heavy drinking, for people aged 15–64 living in the EU in 2004.

Health Burden		Number		Percentage of total		Percentage of the net alcohol-attributable burden	
		Men	Women	Men	Women	Men	Women
Deaths							
	15 to 34	8,037	972	11.1%	3.5%	61.1%	54.9%
	35 to 64	67,155	16,430	11.1%	5.4%	82.6%	69.9%
	Total	75,191	17,403	11.1%	5.3%	79.6%	68.8%
PYLL							
	15 to 34	227,083	26,573	10.8%	3.3%	59.4%	54.5%
	35 to 64	1,034,575	242,578	12.3%	5.7%	79.5%	67.5%
	Total	1,261,658	269,151	12.0%	5.3%	74.9%	66.0%
DALYs							
	15 to 34	1,231,634	249,557	17.2%	4.2%	86.9%	93.7%
	35 to 64	1,705,044	412,395	11.4%	3.5%	87.8%	98.7%
	Total	2,936,678	661,952	13.3%	3.8%	87.4%	96.8%

Alcohol Dependence: Prevalence and Associated Harm

> Alcohol Dependence (AD), a maladaptive pattern of alcohol use in which individuals lose control over their drinking, is one of the most severe consequences of alcohol consumption. AD is linked to many personal and social harms that affect physiological, psychological and social aspects of people's lives. In Europe in 2005, AD affected an estimated 5.4% of all men, and 1.5% of all women, between the ages of 18 and 64. Recent evidence indicates that AD accounts for 62% of all alcohol-attributable net deaths, and 71% of alcohol-attributable deaths. The main cause of this mortality seems to be heavy drinking, as higher levels of consumption are clearly linked to a higher risk of death.

Definition of alcohol dependence

AD can be characterized as an individual's inability to control their drinking. The Diagnostic and Statistical Manual of Mental Disorders (DSM IV) defined it as "a maladaptive use of alcohol" with clinically significant impairment over a period of at least a year. This impairment manifests itself in people in a number of ways, such as:

- having increased tolerance for alcohol (i.e. a person must drink more to feel its effects)
- experiencing withdrawal symptoms when not drinking
- consuming alcohol in greater amounts than intended, or over a longer time
- making unsuccessful attempts to cut down or control alcohol use
- spending a great deal of time obtaining alcohol, drinking it, or recovering from its use
- giving up or reducing former social, occupational, or recreational activities
- continuing to drink despite knowledge of alcohol's physical and psychological damages.[75]

In other words, a number of aspects—physiological, psychological, and social—are relevant for a diagnosis of AD (see reference 76 for the classic discussion of the subject). The ICD uses a similar definition as the DSM,[77] and its measurement of AD overlaps the DSM's to a large degree.[78]

Prevalence of alcohol dependence

Overall, in 2005 close to 11 million people aged 18–64 in the EU suffered from AD. If we include the younger and older age groups as well, this estimate increases to about 12 million (see Web Appendix 12; for regional estimates, see Web Appendix 13). Table 8 provides an overview of the 12-month prevalence rates for AD in all 27 EU countries. Iceland, Norway and Switzerland are included as well, plus Russia as an external comparison.

To estimate prevalence in Europe, we used large general population surveys when these were available; when not, we relied on the WHO Regional Office for figures (see Table 8 for references). Countries located in Southern Europe (primarily Mediterranean countries) had the lowest AD rates: 0.6% for women, and 1.7% for men (see Web Appendix 13 for details on regional differences). These primarily wine-drinking countries not only had lower overall consumption rates, but consistently had the most favourable drinking patterns in Europe, and also in the world (see references 6 and 32). So it comes as no surprise that they had the lowest prevalence of AD in Europe as well (see above). However, it should be cautioned that these figures may not be entirely reliable, due to the role that alcohol plays in these countries. On the one hand, alcohol (most often wine) is deeply culturally embedded; but on the other hand, alcohol problems and dependence are deeply taboo. This means that residents of these particular countries, more than others, may tend not to report symptoms of AD, for reasons of social stigma. (For a wider context and additional explanations, see reference 79.) Other indirect indicators traditionally used for estimating AD rates (the so-called Jellinek formula; see reference 80) suggest a potential underestimation for Italy and Spain, in particular.[vi] But of course, indirect estimates of AD entail problems as well.[84-85]

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vi The problem of prevalence figures for Italy and Spain was further complicated by the fact that the original surveys used a flawed methodology. Questions about alcohol dependence were only asked of respondents who had already scored positively for questions relating to alcohol abuse. This fact led to a severe underestimate of alcohol dependence in the general population.[81] We attempted to correct for this methodology by using numbers from the German Mental Health Survey, where dependence and abuse were assessed independently.[82-83] However, this only corrects some of the underestimation. In countries with "Mediterranean-style" drinking (mostly with meals), the proportion of AD to alcohol abuse is usually larger than in countries with "Nordic-style" drinking—that is, higher rates of drinking apart from meals, and more irregular binge drinking.

In the rest of Europe, especially in the Nordic countries and the Central-East and Eastern European countries, prevalence figures are notably higher (all regional estimates are given in Web Appendix 13). Even Nordic countries with relatively low consumption levels, such as Sweden, have a proportionally much higher percentage of AD. The Central-East and Eastern European countries, particularly the Baltic countries, have the highest prevalence of AD. This stems primarily from the combination of high overall consumption and detrimental drinking patterns—including heavy binge drinking. (See reference 69 for further explanation.)

Table 8: People affected with alcohol dependence, by country

The table below indicates the numbers and prevalence (in percentages) of men and women aged 18–64 affected with alcohol dependence, living in the EU in 2005, by country (best estimates).

	W	M	Women affected	Men affected	Year	Source
Austria	2.5	7.5	66,800	204,800	2008	See reference 86
Belgium	1.9	5.4	51,800	177,100	2001	median of two major surveys: WMHS (corrected), and Belgian Health Survey 2001, cf. GSRA
Bulgaria	1.4	7.3	35,900	184,500	2004	See reference 87
Cyprus	1.6	5.3	4,400	13,800	2004	See reference 87
Czech Republic	0.8	5.0	27,600	173,400	2004	WHS
Denmark	1.9	4.8	32,300	83,000	2005	See reference 88
Estonia	2.1	11.0	9,500	45,400	2004	See reference 87 (own calculations)
Finland	1.9	7.2	31,400	121,500	2000	See reference 89 for under 30-year-olds; 90 for 30-64 year-olds (see also 91)
France	1.5	5.3	284,700	1,001,700	2001-2002	WMHS, adjusted
Germany[1]	1.3	5.4	338,900	1,445,000	1997-1999	See reference 82-83 (personal communication)
Greece	1.5	4.8	53,400	173,800	2004	See reference 87
Hungary[2]	3.4	18.3	114,800	598,600	2004	See reference 87
Iceland	1	3.3	910	3,100	2004	See reference 87
Ireland	2.0	6.4	26,600	86,100	2004	See reference 87
Italy	0.5	0.8	93,600	149,800	2001-2003	See reference 92 (adjusted)
Latvia[3]	1.6	8.4	12,400	60,300	2004	See reference 87 (own calculations)
Lithuania	1.9	9.9	21,600	104,200	2004	See reference 87 (own calculations)
Luxembourg	1.4	5.4	2,000	8,000	2000	median of France and Germany
Malta	0.8	2.8	1,000	3,800	2004	See reference 87
Netherlands[4]	0.5	1.0	26,000	53,100	2007/2009	See reference 93
Norway	3.5	10.5	50,000	154,500	1994-1997	See reference 94
Poland[5]	1.6	8.4	205,500	1,058,200	2004	See reference 87
Portugal	1.7	5.6	58,600	187,700	2004	See reference 87 (we asked for new data from the 2008 survey)

Romania	0.7	2.2	50,000	155,000	2007	See reference 95 et al., 2009 (adjusted)
Slovakia	1.1	10.2	20,200	184,800	2000/2001	MCSS
Slovenia	2.0	10.5	13,200	71,300	1999	GSRA (adjusted for screening scale)
Spain	0.2	1.2	28,410	173,600	2000/2001	WMHS, adjusted
Sweden	3.3	7.7	91,200	219,400	1998-2003	PART study, cf. 69
Switzerland	1.6	8.1	39,300	194,300	2007	See reference 96
UK[6] (England only)	3.6	9.3	683,300	1,745,500	2007	http://www.ic.nhs.uk/webfiles/publications/alcoholeng2009/Final%20Format%20draft%202009%20v7.pdf
EU	1.5	5.4	2,400,00	8,500,000		own calculations
For comparisons						
Russia	3.9	18.0	2,104,800	8,888,700	2004	Based on treatment data from Kirzhanova, V.V., National Research Centre of Narcology, under the Ministry of Health and Social Development of Russia, Moscow[7]

Note: The red-shaded cells indicate more than 150% of the EU average, and the green-shaded cells less than 50%. If the male and female figures have the same shading, the country name is also shaded.

Abbreviations for Data Sources

GSRA: Global Status Report on Alcohol[97]
MCSS: Multi-Country Survey Study[98]
WHS: World Health Survey[99]
WMHS: World Mental Health Survey[100]

Notes on Table 8

1 There are several regional studies in Germany (see overview in reference 69), but this is the latest national survey with comparable methodology. The next national mental health survey is ongoing.
2 Indirect estimations are around 8% for both genders combined, based on a variant of Jellinek's formula (see http://www.gencat.cat/salut/phepa/units/phepa/pdf/phepa_final_report_annex4_hungary.pdf)
3 A recent general-population survey from Latvia in 2011 found prevalence rates of 21% for men, and 4% for women, using standardized methodology (CIDI; personal communication from M. Trapencieris, from the Latvian Centre for Disease Control and Prevention).
4 The prevalence of abuse was found to be 5 times higher in the Netherlands. AUDs have been stable for the past decade, but AD estimates had been markedly higher in past surveys.
5 The prevalence of AD in primary health care in Poland was found to be 19%, using the CAGE screening scale.[101]
6 Other UK estimates include the one cited by the National Institute for Health and Clinical Excellence,[103] which amounted to 6% of men and 2% of women.
7 The Russian treatment multiplier used was quite conservative. We estimated that 33% of urban dwellers with AD are treated, and 10% of rural dwellers. For Western and Central Europe, less than 10% of all people with AD are treated.[102]

Mortality and burden of disease of alcohol dependence as a disease category in 2004

Table 9 gives an overview of the impact of AD disease and mortality in Europe. The figures for death are restricted to situations where AD is mentioned on the death certificate; and the burden of disease is derived by calculating two factors, PYLL and YLD. We added together the PYLL for AD "cause of deaths," and the YLD—the estimated AD incident events were multiplied by the disability weight, and the average duration.[104]

As Table 9 indicates, the burden of disease from AD in European countries varied substantially, even though the average level of alcohol consumption did not. The reasons are at least threefold:

- Drinking patterns varied from country to country; and the burden from AUD seemed to be more prevalent in countries with more problematic patterns.[69]
- There were clear differences between countries in the coding practices for medical death certificates. Some countries (such as Slovakia) rarely, if ever, indicated AD, or "harmful use of alcohol," as the cause of death, even though those countries had a high prevalence of dependence and a high burden of disease. The most likely reasons were the stigmatization of AD, which varies according to a country's culture[105-106]—and, overall, is stronger than for other mental disorders.[107] A further issue may well be the impact of insurance rules, since in some countries life insurance does not cover death from alcohol-related causes.
- The WHO algorithms seemed not to work in some countries, where AD or harmful use of alcohol was determined as the cause of death in one gender only (e.g. Cyprus). This is implausible, since AD was clearly present in all European countries for both men and women (see Table 8, above).

Table 9: Deaths, PYLL and DALYs lost due to alcohol dependence

The table below indicates the population standardized deaths, PYLL and DALYs lost due to alcohol dependence as a disease category, by sex and country, for people aged 15–64 living in the EU in 2004.

	Deaths (per 100,000 people)			PYLL (per 100,000 people)			DALYs (per 100,000 people)		
Country	Women	Men	Total	Women	Men	Total	Women	Men	Total
Austria	0.73	4.26	2.52	12.2	66.1	39.5	118.6	612.0	368.2
Belgium	0.62	2.63	1.63	11.4	47.1	29.4	112.5	337.4	225.7
Bulgaria	0.06	1.65	0.85	1.2	26.0	13.5	94.7	527.3	309.7
Cyprus	0.01	0.04	0.02	0.1	0.6	0.3	0.1	368.3	179.2
Czech Republic	0.50	2.01	1.26	8.9	32.0	20.5	74.5	623.4	349.9
Denmark	2.11	10.18	6.19	34.3	154.6	95.0	148.8	738.0	446.2
Estonia	3.25	16.47	9.59	55.0	285.6	165.7	230.2	1622.2	898.2
Finland	0.95	5.70	3.35	15.0	101.9	59.0	156.7	1009.1	587.6
France	1.19	6.68	3.93	20.6	114.8	67.7	146.5	751.0	448.5
Germany	1.30	6.56	3.96	21.4	109.2	65.9	132.4	774.4	457.8
Greece	0.01	0.26	0.14	0.3	5.1	2.7	100.1	514.8	309.4
Hungary	0.75	5.92	3.30	12.8	94.6	53.1	251.7	1919.7	1073.8
Iceland	0.25	0.85	0.56	4.8	16.1	10.6	82.8	407.9	248.3
Ireland	0.92	1.91	1.42	15.2	39.0	27.2	138.5	662.0	402.1
Italy	0.06	0.29	0.17	1.2	4.8	3.0	51.5	77.2	64.4
Latvia	0.45	3.38	1.86	8.0	56.7	31.5	189.4	1444.5	794.9
Lithuania	0.19	1.44	0.79	3.8	25.1	14.1	215.1	1640.7	903.3
Luxembourg	1.09	5.16	3.15	20.9	84.7	53.2	140.7	694.7	420.8
Malta	0.00	0.30	0.15	0.0	6.1	3.1	66.6	345.0	207.9
Netherlands	0.21	1.20	0.71	3.2	19.7	11.5	96.1	758.9	430.9
Norway	0.47	4.08	2.30	8.8	58.2	33.9	301.2	1314.5	815.5
Poland	0.62	7.34	3.95	10.9	128.5	69.2	115.4	685.8	398.3
Portugal	0.15	1.40	0.77	2.8	24.3	13.4	113.7	591.2	349.4
Romania	0.80	4.69	2.74	13.1	77.5	45.1	142.4	772.0	455.5
Slovakia	0.00	0.04	0.02	0.0	0.6	0.3	90.5	1164.4	624.5
Slovenia	1.28	6.52	3.94	21.0	107.9	65.0	114.0	579.4	349.8
Spain	0.10	0.87	0.49	1.7	13.5	7.7	21.2	160.3	91.4
Sweden	0.81	4.19	2.53	11.5	62.6	37.5	282.7	969.7	631.6
Switzerland	0.87	2.61	1.74	14.7	40.0	27.4	116.4	562.0	339.7
United Kingdom	0.65	1.91	1.28	12.1	34.2	23.1	189.4	939.3	562.9
Total (European Union)	0.68	3.83	2.26	11.7	64.5	38.1	121.1	654.9	388.5
For comparison:									
Russia Federation	1.04	6.64	3.74	18.1	119.7	67.0	288.8	2058.8	1141.0

Note: The red-shaded countries had an AD-related burden of disease (DALYs) that was more than 50% above the EU average; the burden of the green-shaded countries was at least 50% below the EU average.

Despite considerable problems with measurement in the official WHO statistics,[vii] and in the underlying surveys (see above), we can still identify clear patterns in the burden of AD across the EU. The traditional wine-drinking countries in the Mediterranean and Central-Western Europe (Italy, France, Greece, Portugal, Spain), which have consistently decreased their overall consumption of alcohol in recent years,[24] had lower rates of AD than the EU average (see Table 8). This may be due to the pattern of drinking in those countries, where alcohol is consumed predominately (often exclusively) with meals; in general, intoxication and binge-drinking are avoided. While we believe the prevalence of AD to be underestimated in Italy and Spain, all indicators still point to a relatively low prevalence in the Southern European region.

This pattern of drinking contrasts with countries in Eastern Europe, where overall consumption is much higher. Drinking spirits rather than wine, as well as drinking to intoxication, is much more common there; and this leads to a greater burden of AD. These are mainly the Baltic countries, as well as Hungary and Slovakia. Notably, these are also less-wealthy countries, where the GDP PPP is below the EU average.

The Nordic countries, and the Central-West and Western European countries, exhibited AD rates that fell in between the Southern European and Eastern European rates. The Nordic countries' rates were relatively high compared to their consumption levels, which may be explained by their higher rates of irregular heavy drinking leading to intoxication.[69] For the Central-West and Western European region, drinking patterns in the largest countries—Germany and France—are closer to the Southern European pattern described above. This means that the overall population standardized impact of AD in the Central-West and Western European countries is lower than in the Nordic countries and the Central-East and Eastern European countries.

The overall health burden attributable to alcohol dependence as a risk factor

AD is not only a disease that can lead to premature death and disability; it is also a major risk factor for other diseases, with their own associated mortality and disability burdens. (The Comparative Risk Assessment of the GBD defines a risk factor as any attribute or exposure that is causally associated

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vii There are also some peculiarities in the underlying WHO statistics. For instance, the WHO identified Cyprus as a country with no AUD deaths or burden of disease for women, which was certainly incorrect. Similarly, the death rate in Slovakia due to AUD was calculated as zero. This fact was identified as the result of a country-specific coding pattern for cause-of-death certificates, which led to an underestimation of the AUD-related burden of disease.

with the increased probability of a disease or injury.[108-109]) The difference between a disease condition and a risk factor is crucial. AD may lead to an overdose in drinking, and thus may appear on the death certificate as the cause of death as part of routine vital registration. However, AD may also cause other fatal conditions, such as oesophageal cancer or liver cirrhosis; and thus it would still be causal to these deaths, even though it is not listed as cause of death on the death certificate. In such cases, when the cause of death is a disease or injury other than AD, AD is considered a risk factor.

Harris and Barraclough,[110] in the most recent (1998) systematic review and meta-analysis of the mortality burden attributable to AD, found that the standardized mortality ratio[viii] (SMR) for people with AD was about twice that of the general population (of the same sex and age, in the same region). For both sexes combined, excess mortality was highest in the two categories of injury, and mental and digestive disorders. In the case of injury, both unintentional and intentional, suicide was the leading cause of intentional death; and in the case of mental and digestive disorders, liver cirrhosis was the leading cause of the latter.

Studies since 1998 have supported Harris and Barraclough's findings, but found considerably higher SMRs, especially in treatment populations. (For some European examples, see references 111-114.) For instance, Hayes and colleagues[113] recently conducted a large follow-up study in England of more than 10,000 patients. The study, based on treatment registers in London, reported SMRs of 9.3 for patients under the age of 45, and of 4.5 for patients aged 45–64. The difference between the SMR of 2 found in the Harris and Barraclough meta-analysis, and the much higher numbers in the Hayes study of 2011, can be explained in part by the fact that the original meta-analysis[110] included all cohorts of AD; whereas the London study[113] included only patients in specialized treatment for alcohol use disorders, who may have had more severe forms of dependence. This conclusion is supported by the fact that cohorts from the general population with AD tend to have smaller risks. (For examples, see references 115-117, including studies by Perälä and colleagues for the subgroup without psychotic disorders.)

In summary, AD is a strong risk factor not just for premature mortality, but also for other diseases and injuries.

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viii The Standardized Mortality Ratio (SMR) is a measure of mortality in a given study population—in our case, people with AD—relative to the mortality in a reference population—in our case, the general population of the same sex and age. In this case, an SMR of 2 means that mortality was twice as high in the study population as it was in the general population (same sex and age) in that region.

Quantifying the mortality burden of AD

We estimated the mortality burden of AD across the EU by using the following assumptions, based on the scientific literature:

- For 20% of the people with AD, we utilized the SMRs of Hayes and colleagues,[113] assuming that 20% reflected the number of people in treatment or with similarly severe dependence.

- For the remaining 80% of the people with AD, we assumed different levels of SMR based on sex and age. In the age range of 15-44, we assumed an SMR of 2.25 for men, and 2.7 for women. In the age range of 45 and older, we assumed an SMR of 2 for men, and 2.4 for women. These figures reflected the SMR associated with average severity of untreated AD in the general population. (There are three studies in the community of mortality risks for men, two involving a very long follow-up period; see references 118-120.)

These Relative Risks (RRs) can be combined with the overall prevalence of AD in Europe to obtain alcohol-attributable fractions. The exact formula used for calculating categorical risk was derived from the general formula for counterfactuals (see references 109 and 121), with no AD assumed to be the counterfactual of minimum risk:

$$PAF = \frac{\sum_{i=1}^{n} P_i RR_i - \sum_{i=1}^{n} P_i^{'} RR_i}{\sum_{i=1}^{n} P_i RR_i}$$

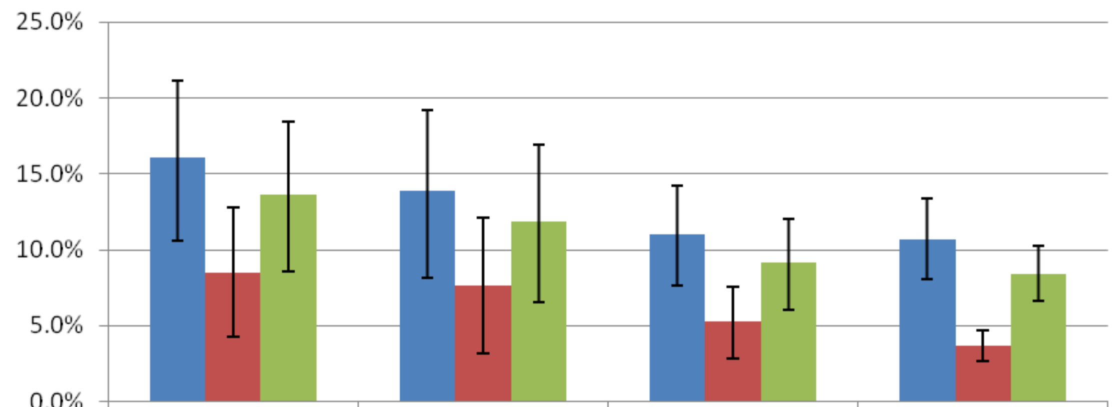
In this formula, P_i represents the proportion of the population with AD; P_i' represents the proportion of the population given a counterfactual exposure level, i.e. no AD in the population under consideration; RR represents the relative risk of a given outcome at exposure level i; and n is the number of exposure levels. In other words, these population-attributable fractions measured the potential proportional reduction of mortality, assuming that there was no AD in Europe. If the attributable fractions are applied to the actual mortality burden, they can be interpreted as the AD-attributable burden, similar to the alcohol-attributable burden described above (see also Web Appendix 2). If we apply these formulas to the different countries of the EU, and then add the results together to calculate the total EU burden, the result is a figure of 72,888 deaths for men, and 12,179 for women, due to AD.

Comparing alcohol-attributable mortality

In the following section, we will examine the different fractions of the EU mortality burden caused by alcohol consumption as a whole, by heavy drinking, and by AD. Figure 13 summarizes these different mortality burdens in the population aged 15–64 years. It outlines the overall burden of alcohol consumption (considering only the detrimental effects on mortality, not any beneficial effects; see Table 4, above); the net burden, which has been mainly considered before (i.e. taking into consideration the beneficial effects); the burden for heavy drinking, using the WHO risk categories (40+ g of pure alcohol for women, 60+ g of pure alcohol for men); and the mortality burden due to AD.

Figure 13: Mortality attributable to alcohol consumption and AD

The figure below indicates the proportion of mortality attributable to alcohol consumption and AD, for people aged 15–64 living in the EU in 2004.



	Alcohol-attributable	Alcohol-attributable (net)	Heavy drinking	Alcohol dependence
Men	16.1%	13.9%	11.1%	10.7%
Women	8.5%	7.7%	5.3%	3.7%
Total	13.6%	11.8%	9.2%	8.4%

Note: "Heavy drinking" is defined as 40+ g of pure alcohol per day for women, and 60+ g of pure alcohol per day for men. The technical details of the calculations of mortality attributable to AD (including the CIs) can be found in Web Appendix 14; the other alcohol-attributable fractions in Figure 13 are explained above.

As can be seen, most of the mortality burden stems from heavy drinkers (about 77% of the net burden, 67% of the overall burden). AD makes up of 71% of the net burden, and 62% of all harmful alcohol-attributable mortality. In other words, a substantial part of the overall alcohol-attributable mortality burden is due to AD, caused in part by heavy drinking. This finding has some important implications for public health:

- If an effective treatment for AD could be delivered to a sizable portion of the affected population, it would have a profound and positive effect on overall public health through reduction of mortality.

- To be effective, a treatment must reduce heavy drinking in people with AD. This can be done either by encouraging abstinence, or by substantially reducing the average level of drinking—especially by reducing episodes of heavy drinking. As most RRs have an exponential dose-response relationship (that is, a linear relationship between exposure and logarithmized risk), a reduction in the heaviest drinking occasions would produce a disproportional benefit in the number of deaths avoided.

- The reduction of the alcohol-attributable risk in Europe should be seen on a continuum of risk involving three groups:

    - In the general population, the level of overall consumption should be reduced.

    - Special emphasis, in the form of effective brief interventions, should be given to people who are problem drinkers, and those who drink heavily but are not technically dependent.[122]

    - People with AD should be treated.

Before we discuss these implications further, the potential limitations of this key result should be examined. These conclusions rely on the underlying assumptions of the validity of the prevalence data, and of the RRs. There have been some problems in certain countries (see above) with measuring the prevalence of AD: some of the individual country figures may be under- or over-estimated. In the general EU population, however, there are sufficient well-conducted studies to indicate that the overall figure of about 3.4% is not an overestimate. For one thing, this figure is quite close to the estimates for other high-income countries, such as the US at 3.8% (see reference 123). The same caveat applies to the RRs. The mortality risks used depend on pooled estimates of general population studies, plus the use of one of the largest recent studies for the treatment samples. Methodologically rigorous meta-analyses are necessary to quantify the risks for both the general population and the treatment samples; and these formal analyses may result in slightly different estimates. However, this does not seem to invalidate the overall conclusion.

As expected, the proportions of heavy drinking to all alcohol-attributable mortality burdens (both net and total) do not vary between EU regions (see Web Appendix 15). However, the proportions of the AD mortality burden to all alcohol-attributable mortality burdens do vary considerably: from slightly over 30% in the Southern European region countries, to almost 95% in the Nordic countries. Both other regions (Eastern and Western) are relatively close to the European average. This underlines, yet again, the cultural differences when it comes to respondents answering AD surveys: Southern Europeans clearly have a tendency to answer such questions less affirmatively, especially with respect to losing control as a result of drinking.

Overall Burden and Social Costs of Alcohol Dependence

> While the burden of AD is a major public health problem, other consequences also have marked impacts on the societies of the countries affected. These include societal harms such as divorce, family problems, workplace problems, and vandalism; and also economic damages, such as individual costs, lost workplace productivity, increased health care costs, etc. In 2010, the overall social costs of alcohol consumption in Europe were estimated at some €155.8 billion. A cautious estimate of the economic costs of AD would be between €50 billion and €120 billion. Further research is needed to calculate this figure more precisely.

Burdens attributable to AD

Thus far in this report, we have concentrated exclusively on the alcohol-attributable health burden. However, AD causes additional burdens that go beyond health. Figures 14 and 15, below, give a conceptual overview not just of the health burdens, but also of the social and economic burdens. These are further broken down into their effects on four affected groups: individuals, families, work, and society. The two tables also break down the effects into two timeframes. The first, Figure 14, shows the effects immediately following alcohol-attributable incidence; the second, Figure 15, shows the effects after 3–5 years of persisting alcohol dependence. (These results are based on the literature outlined in the following references: for health, see 110; 124-125; for economic burden, see 7; 126-128; for interpersonal relationships and society, see 129; and for work, see 130.)

Figure 14: Burdens of AD, after incidence

The figure below provides a conceptual overview of the burdens of alcohol dependence, after incidence.

Burdens	Individual[131]	Family/partnerships/close friendships[132]	Work[130]	Society[128]
Health burden	Injuries; blackouts; hours of drunkenness; alcohol-dependent style of drinking that could aggravate existing health problems	Injury (e.g. from child neglect or drunk driving); stress-related problems for other family members; FASD; interpersonal violence	Injury	Injuries to self and others, including consequences; acute-care hospitalizations for health problems caused by alcohol; FASD
Social burden[131]	Decreases in functionality associated with AD (blackouts, hours of drunkenness); decline in social role; loss of friendships; stigma	Problems with parental roles, partnership roles, and caregiver roles (e.g. to children, parents)	Teamwork problems; others having to compensate for lack of productivity	Social costs of alcohol; vandalism
Economic burden	Depends on country and socio-economic status; often cost of alcohol plus cost of possible job loss, or absenteeism	Financial problems resulting from the health and social consequences of alcohol; negative effects on family budgets and household expenses	Absenteeism and other productivity costs (mainly suboptimal performance when on the job, and short-term disability)	Productivity losses; health care costs (including treatment of AD); costs in the legal sector (police, court, prisons)

Figure 15: Burdens of persistent AD

The figure below provides a conceptual overview of the burdens of persistent alcohol dependence, after 3–5 years.

Burdens	Individual[131]	Family[132]	Work[130]	Society[128]
Health burden	Morbidity from diseases caused or worsened by AD and associated premature mortality	Injury (e.g. from child neglect or drunk driving); stress-related problems for other family members; FASD; interpersonal violence	Injury	Acute care hospitalizations for health problems caused by alcohol; injuries; infectious diseases; FASD
Social burden[131]	Decreases in functionality associated with AD (blackouts, hours of drunkenness); decrease in social role; loss of friendships; stigma	Problems with parental roles, partnership roles, and roles as caregiver in general (e.g. to parents)	Team problems; others having to compensate for lack of productivity	Social costs of alcohol; vandalism
Economic burden	Dependent on society and on socio-economic status of person with AD; often cost of alcohol plus cost of possible job loss or absenteeism; possible social drift downwards	Financial problems resulting from health and social consequences of alcohol impacting on family budget and household expenses	Absenteeism and other productivity costs (mainly suboptimal performance when working and disability, short- and long-term); replacement costs in case of premature mortality or long-term disability	Productivity losses; health care costs; costs in the legal sector (police, court, prisons)

One problem with this approach is that it is difficult to measure all the burdens comparatively across EU countries. While the health-care sector is standardized by the ICD system, with comparable diagnoses and causes of death, the social and economic sectors are not similarly standardized. One way around this is to compare countries based on studies of "social costs"—defined as all costs to society arising from alcohol consumption that are **not** borne exclusively by the drinker. This measure represents the negative economic impact of alcohol consumption on the material welfare of a society.

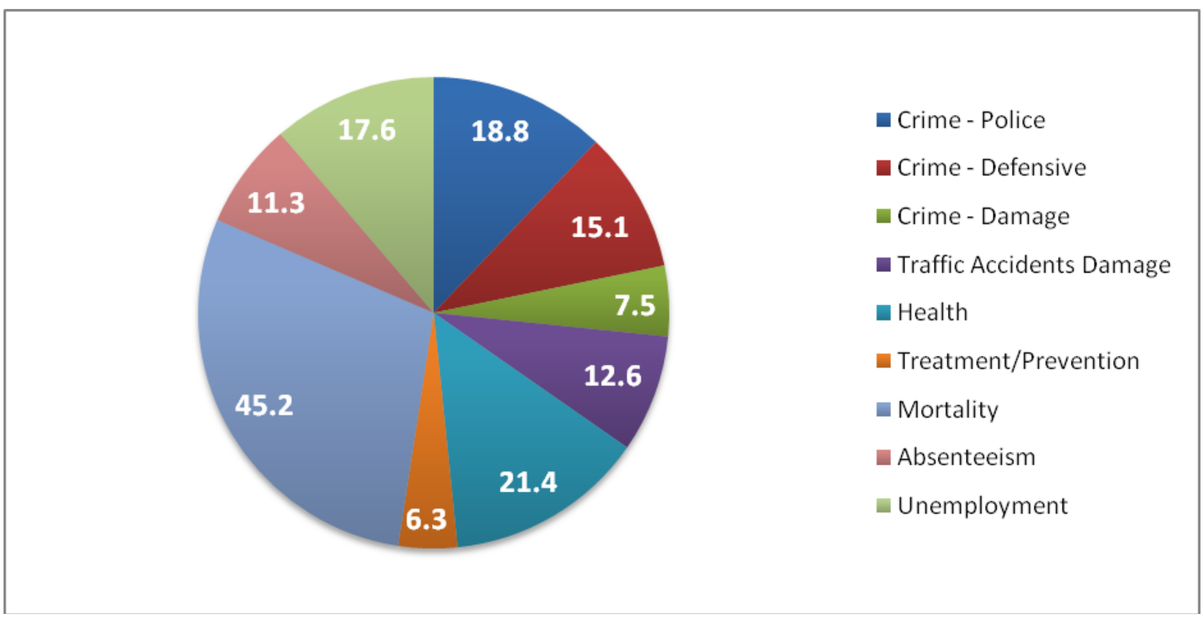
The social cost of alcohol and AD

Given this description of Europe's alcohol and AD burden, it comes as no surprise that the overall social costs of alcohol use are so high. When defining social costs, it is important to make a key distinction between direct and indirect costs. Direct costs refer to the value of goods and services actually delivered to address the harmful effects of alcohol consumption. Indirect costs represent losses of potential productivity, i.e. the value of services not performed by individuals because of the adverse consequences of their drinking. In several studies of social costs, it was found that the direct costs to sectors (other than the health-care sector) were higher than the health-care costs (see the overview in reference 2). In addition, most studies found that the indirect costs, i.e. productivity losses, outweighed the direct costs by far.

The first comprehensive estimates of social costs for the EU in 2003 were made by Anderson and Baumberg in 2006.[131] Based on this seminal work, the social costs for 2010 can be broken down and summarized in Figure 16. These estimates assume that the proportion of GDP attributable to alcohol consumption—1.3%—has been constant since Anderson and Baumberg's assessment for 2003. (Average 1.3% of GDP; lower limit 0.9%; upper limit 2.4%.) Using that figure as a guide, the social costs of alcohol consumption for the year 2010 would amount to €155.8 billion (lower limit €107.9 billion, upper limit €287.7 billion).

Figure 16: Social costs of alcohol in the EU, 2010

The figure below indicates the 2010 social costs of alcohol in the EU (in €billion).



To put this estimate in perspective, Rehm et al.[2] found higher proportions of GDP, 2.5%, in selected high-income countries. But this weighted average was hugely impacted by US figures, where Mohapatra and colleagues[128] found a slightly higher proportion than Anderson and Baumberg's review of all high-income EU countries: 1.6% of GDP. It should be noted that the EU does not only consist of high-income countries. However, the only social-cost study to date from an upper-middle-income EU country (Estonia, which at that time was less prosperous) also found a social-cost proportion of 1.6% of GDP.[133]

We may ask: what proportion of these alcohol-attributable social costs is due to AD? Mohapatra et al.[128] estimated the social costs of alcohol dependence via heavy drinking. They concluded that 0.96% of GDP, or 62% of all social costs attributable to alcohol, were due to AD—which works out to a figure of €94.6 billion. If we applied the estimate of 0.96% of GDP to the European GDP for 2010, the result would be €115.1 billion. The most recent European cost study, in 2011,[134] estimated the costs for selected addictions (including alcohol and opioids) at €65.7 billion. This is much lower than the above estimates, and not really comparable, since it also included the costs for opioid dependence.

As we can see, it is hard to estimate the true costs of AD for the EU from these data. Still, a cautious estimate might be somewhere between €50 billion and €120 billion. This is admittedly a wide interval, and underscores the need to conduct a new study on the social costs of AD: further research is needed to calculate this figure more precisely for the EU. However, it also reveals that the costs of AD in Europe are enormous, even using the lowest available estimates.

The Medical Treatment System for Alcohol Dependence

> Less than 10% of people with AD in the EU receive treatment for their alcohol dependence, meaning that the overwhelming majority of people with AD (9 out of 10)receive no intervention. Treatment systems differ across Europe; but in almost all countries, psychotherapeutic intervention is the backbone of rehabilitation treatment aimed at preventing relapses of heavy drinking.

Proportion of people with AD in treatment

As we have seen, AD is an important contributor to the burden of disease (see references 2 and 64). Given this situation, evidence-based means to reduce the AD-related burden are vital. One important measure is alcohol dependence treatment (ADT). However AD, like most other mental disorders, is severely undertreated; that is, most people with AD do not seek or receive treatment. (See reference 102; for mental health in general, see reference 135). In the European Study of the Epidemiology of Mental Disorders (ESEMeD), with general population surveys in Belgium, France, Germany, Italy, the Netherlands and Spain, only 8.3% (95% CI: 3.8%–12.8%) of people who were diagnosed with AUD in the past 12 months received any formal treatment for their condition during that period. This proportion is smaller than for any other mental disorders (see reference 102 for the prevalence of consulting a formal mental health service with any mental disorder: 25.7% (95% CI: 23.35–28.15)).

Most services were provided either by mental-health professionals, such as psychotherapists or addiction counsellors; or by a combination of general practitioners (GPs) and mental-health specialists.[102] The majority of treatments (two-thirds) involved psychotherapeutic interventions, either alone or in combination with drug treatment. Pharmacological treatment was used in about 50% of the treatments, with 60% of all pharmacological treatment occurring in combination with psychological interventions.[102]

Another way to estimate treatment coverage in Europe is by comparing the estimates for people with AD with the statistics of people in treatment. Unfortunately, the WHO provides figures only for in-patient treatment, and even these are not available for several EU countries (see Web Appendix 16). And data on out-patient and GP treatment are even scarcer. As a result, we had to use two statistical techniques for estimating the missing values. These led to comparable results. If the estimate for treatment coverage was based on the available proportion of people with AD treated in Germany, Hungary, Italy and Sweden (see Web Appendix 16), we calculated about a 8.7% treatment coverage rate; whereas basing our estimate on the proportion of in-patient to out-patient treatment, the figure is 10.2%. Thus, our indirect estimates (based on treatment statistics) corroborate the result from the ESEMeD study: fewer than 1 in 10 people with AD receive ADT.

Treatment in the EU: reduction of drinking as a goal

There have been few, if any, systematic comparative studies on the actual practice of AD treatment in Europe.[ix] One systematic review of the literature, and a key informant survey on treatment practices, was conducted in 2011 by Rehm and colleagues. They relied on national and other guidelines for treatment, supplemented by the survey. While many of the results are qualitative in nature, and thus allow only cautious conclusions to be drawn, the results are summarized in Table 10, below.

The survey found that only about 33% of EU countries have national guidelines governing ADT, and about a similar number have professional guidelines (although there is some overlap, with Germany and the UK having both forms of guidelines). Generally, in the EU psychotherapies are used to treat AD, most often Cognitive Behavioural Therapy (CBT) and Motivational Interviewing (MI; see Table 10). When we speak about treatment here, this refers to the rehabilitation phase—usually after a detoxification phase (depending on the treatment goal). Some countries also employ the Minnesota model, or another 12-step approach. The latter are based on the concept of “alcoholism” as a chronic, incurable, but stoppable disease; whereas CBT and other concepts do not imply any explanations of “chronicity” to justify the therapeutic process.

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ix This section is based in part on Rehm, Rehm, Ahlo, Allamani, Aubin, Bühringer, Daeppen, Frick, Gual, & Heather (2011). Alcohol dependence treatment in the EU: a systematic review of treatment goals and modalities in all EU countries plus Iceland, Norway and Switzerland. CAMH: Centre for Addiction and Mental Health.

Regional patterns in the EU are difficult to distinguish. The major Western countries all use CBT and some form of motivational treatment, while the Eastern countries generally seem to prefer 12-step programs and self-help groups. Every EU country uses at least one AD medication, and often more: the most commonly prescribed are acamprosate, disulfiram and naltrexone. However, pharmacotherapy seems to be used in only a minority of all ADT. It should be noted that reduced drinking as a treatment outcome is accepted (in practice) in all EU countries, aside from the smaller nations of Cyprus and Malta.

Table 10: Characteristics of ADT systems

The table below gives an overview of the characteristics of alcohol dependence treatment systems in different European countries.

	National guideline	Other professional guidelines	Abstinence as main goal	Reduced drinking acceptable (in practice)	Main psychotherapy used (abbreviations below)	Main pharmacotherapy used in rehabilitation phase
Austria	No	Yes	Yes	Yes	wide variety used	Acamprosate, Naltrexone, Disulfiram
Belgium	No	No	Yes	Yes	counselling; family-oriented interventions	Acamprosate, Disulfiram
Bulgaria	No	No	Yes	Yes	multidisciplinary (12-step oriented), CBT	Naltrexone, Disulfiram (not officially registered)
Cyprus	Yes	No	Yes	No	CBT, MET, relapse prevention, family-oriented	Mainly benzodiazepines for withdrawal; Acamprosate for rehabilitation treatment
Czech Republic	No	Yes	Yes	Yes	BI, CBT, MET, family therapy / intervention?	Acamprosate, Naltrexone, Disulfiram
Denmark	No	Yes	No	Yes	MET, CBT	Acamprosate, Naltrexone, Disulfiram
Estonia	No*	No	Yes	Yes	CBT, group therapy, family therapy	Disulfiram
Finland	No	Yes	No	Yes	CBT, MET, Minnesota model, AA	Naltrexone, Disulfiram, Nalmefene (Acamprosate only under special licence)
France	Yes	No	Yes	Yes	CBT, group therapy, self-help	Acamprosate, Naltrexone, Disulfiram
Germany	Yes	Yes	Yes	Yes	CBT, family, ergo & socio therapy	Acamprosate, Disulfiram
Greece	No	No	Yes	Yes	CBT	Naltrexone, Disulfiram (rarely)
Hungary	Yes	No	Yes	Yes	CBT, MET, family, problem & group therapy	Acamprosate, Naltrexone, Disulfiram
Ireland	No	No	Yes	Yes	Minnesota model, MI, CBT (AA aftercare)	Acamprosate, Disulfiram
Italy	No	No	Yes	Yes	family, group & individual counselling	Disulfiram, chlordiazeposside
Latvia	No	Yes	Yes	Yes	wide variety used	Disulfiram (Acamprosate and Naltrexone only rarely)
Lithuania	No	No	Yes	Yes	Minnesota model, group therapy	Naltrexone, Disulfiram

Luxembourg	No	No	Yes	Yes	MI, CBT, family & group therapy	Disulfiram, Acamprosate
Malta	No	No	Yes	No	Minnesota model	Disulfiram
Netherlands	Yes	No	No	Yes	MET, CBT, CRA	Disulfiram, Naltrexone, Acamprosate
Poland	Yes	No	Yes	Yes	CBT, self-help (AA)	Disulfiram, Acamprosate
Portugal	No	No	Yes	Yes	CBT, 12-step treatment	Acamprosate, Disulfiram
Romania	No	No	Yes	Yes	Minnesota model, AA	Rarely Naltrexone
Slovakia	No	No	Yes	Yes	CBT	Acamprosate
Slovenia	Yes	No	Yes	Yes	psychodynamic therapy, CBT, MET	Naltrexone
Spain	No	Yes	Yes	Yes	CBT, group therapy	Disulfiram, Naltrexone, Topiramate, Acamprosate
Sweden	Yes	No	Possible	Yes	CBT, 12-step, MI, CRA, BI	Naltrexone, Topiramate, Acamprosate
United Kingdom	Yes	Yes	Possible	Yes	CBT, MET, 12-step, psychosocial	Disulfiram, Acamprosate
EU	33.3% Yes/ 66.7 No	29.6% Yes/ 70.4% No	88.9% Yes/ 11.1% No	92.6% Yes/ 7.4% No	mainly CBT, MET, BI, group/family, sometimes Minnesota Model, AA	Disulfiram, Acamprosate, Naltrexone
Iceland	Yes	No	Yes	No	Minnesota model, BI, MI, CBT, family	antipsychotic medication
Norway	No	No	?	Yes	CBT	Disulfiram, Acamprosate
Switzerland	No	No	Yes	Yes	CBT, psychodynamic therapies	Acamprosate, Disulfiram, Naltrexone

List of Abbreviations

AA: Alcoholics Anonymous

BI: brief interventions

CBT: cognitive behavioural therapy

CRA: community reinforcement approach

MET: motivational enhancement therapy

MI: motivational interviewing

*Estonia has guidelines governing drug abuse that do not specifically mention ADT.

Intervention Scenarios

> There are treatment interventions available, in the form of psychotherapies and pharmacotherapies, that could reduce the burden of alcohol-attributable mortality. The most efficacious current options would reduce the death rate by some 13% in men (more than 10,000 deaths avoided), and by some 9% in women (more than 1,700 deaths avoided). This improvement could be accomplished within 12 months. This estimate assumes a treatment coverage of 40% of all people with AD, and also assumes that the average treatment effect (derived from past randomized trials) holds true.

Given the extent of the burden from alcohol use and AD in Europe, a public-health perspective certainly indicates the urgency of initiating and implementing interventions to reduce this burden. As we will discuss, traditional alcohol policy is mainly concerned with preventive measures such as taxation, bans on marketing and advertising, and drinking-and-driving countermeasures. However, as the majority of the burden is due to AD, and as fewer than 10% of the people affected by this disease are currently treated (see reference 102), improving access to treatment seems important.

However, such a strategy would only work if the treatment options available are effective in terms of improving survival, and reducing the burden of disease. This requires demonstrating the following two key points:

1) Proving that reductions in drinking rates—including, though not limited to, achieving abstinence—have a demonstrable effect on survival and burden of disease.
2) Proving that treatment interventions for AD are successful in reducing drinking rates, or leading to abstinence.

If this can be done effectively, treatment interventions will lead to improved survival rates, and to a reduced burden of disease. However, before statistically modelling such effects, we must first review the literature on these two key points.

Do interventions affect survival?

The effectiveness of AD treatment interventions are usually defined by how much they affect alcohol consumption—i.e. whether they lead all the way to abstinence (the traditional aim of AD therapy, as indicated above), or at least to a reduction in consumption.[136-137] In the following section, we will examine whether these two approaches have any impact on mortality.

At the population level, a large volume of literature suggests that changes in drinking level are associated with changes in mortality due to alcohol-related diseases, as well as all-cause mortality (for Europe, see references 70 and 138; for general data, see 139). This literature is based on time-series analyses; and as is the case with all ecological data, associations can be measured but causality may not necessarily be established.

However, there are also a number of “natural experiments” that demonstrate how marked reductions in availability of alcohol can lead to reductions in both drinking and mortality. The most prominent example is the Gorbachev reform of the 1980s, during which legal alcohol production was drastically reduced in the Soviet Union. One result was that the overall annual consumption of pure alcohol fell from 14.2 L per capita in 1984, to 10.7 L in 1987—a decrease of some 25%. As a consequence, in that time period, all-cause mortality rates in Russia in the 40–44 age range decreased by 39% for men, and by 29% for women. But when the alcohol ban was rescinded, consumption increased again to slightly more than its former level: 14.5 L per capita. And between 1987 and 1994, when alcohol consumption increased again, all-cause mortality rates more than doubled for men, and almost doubled for women in the age group 40–44.[9]

Other examples of natural experiments where a reduction of alcohol availability resulted in a reduction of mortality are:

- The twelvefold rise of taxes on distilled spirits during the First World War in Denmark, which led to a subsequent reduction of overall consumption and related mortality.[140-141]
- The impact of Prohibition in the US (1919) on liver cirrhosis deaths: the bill reduced alcohol consumption to 30% of its former level in the years after its enactment.[142]

- The effect of German seizure of wine in France during World War II, again reducing both consumption and mortality from liver cirrhosis.[50]

Unfortunately, such "natural" experiments that affect large cohorts are scarce; and smaller-scale experiments are not feasible, since for obvious ethical reasons we cannot conduct experiments on individuals' long-term alcohol consumption. However, there have been some short-term experimental studies that deal with the effects of manipulating alcohol intake on blood pressure—an important risk factor for hypertensive disease, stroke and other cardiovascular outcomes. These studies clearly show that a reduction of alcohol intake will reduce blood pressure.[143] As well, some literature exists on the effects of alcohol cessation on both liver cirrhosis and cancer; again, this supports the hypothesis that stopping drinking leads to a reduction of risks for those diseases.[144-145] The effect does include a time lag, with a complicated structure that depends on the disease. For liver cirrhosis mortality, there is both an immediate effect as well as a lagged effect: most improvement occurs during the first year. For cancer there are no immediate effects, only delayed ones (see references 144–145, and 49). But despite this time lag effect for cancer, most studies have calculated the effect as if it were immediate (see reference 6, as well as the discussion in 59). The calculations for burden of disease, noted above, also followed this tradition. However, in this chapter we will leave cancer out of our calculations, as we aim to model the effects of treatment on a reduction of mortality within 12 months after the intervention.

Literature on the effects of consumption reduction or cessation is scarce. Fillmore and colleagues[146] analyzed a nationally representative sample from the US, and found that in general, reduction of heavy drinking in men was associated with an increase in survival. These effects are in line with those observed in cross-sectional studies, where higher levels of consumption were consistently associated with higher mortality risks.[40] As a result, brief interventions administered to heavy drinkers admitted to general hospitals in a Cochrane analysis not only resulted in a significant reduction of alcohol consumption, but also in a substantial reduction of mortality risk up to a year later. (Risk Ratio: 0.6, 95% CI: 0.4-0.9; see reference 147; based on 7 randomized clinical trials).

As indicated above, the crucial element in reducing the mortality burden of AD is alcohol intake after treatment. This fact is outlined in the five studies cited below.

- In a German study conducted by Feuerlein and colleagues in 1994, patients who abstained for at least six months had only a third of the mortality risk of the people who relapsed.[148]

- In Sweden in 1997, Gerdner and colleagues found that survival after 8.5 years in a small sample of AD patients depended on the short-term outcome. None of the people who achieved abstinence died; and for women (but not for men) the reduction of drinking had a significant positive effect on survival rate (SMR 5.0 vs. 13.3).[112]

- A US study from 2000 found that patients who died prematurely in a 10–14 year follow-up had consumed more alcohol in the year after treatment than the survivors.[149]

- In another 1994 study of individuals seeking help for an AUD in the US, readmission to treatment within a year was found to be a significant predictor for mortality.[150] When this characteristic was controlled for, better drinking outcomes at the one-year mark were associated with a lower likelihood of subsequent death in the 16-year follow-up.[151]

- In a US study from 1991, individuals who relapsed in the second year had slightly elevated mortality risks in the tenth year, but this difference was not significant.[152] This study is also notable for revealing that behind the categorical statements of relapse and remission, there are clear differences depending on the quantity of alcohol consumed. Reformed alcoholics who drank, consumed 1 ounce of pure alcohol daily; whereas relapsed alcoholics consumed 3.5 ounces (community controls: 0.7 ounces).

Taken together, these studies clearly showed that the outcomes of treatment are important for survival. People had a higher chance of survival if they achieved abstinence after treatment, or if they could reduce their volume of consumption.

Effectiveness of ADT on reducing consumption

For the goal of setting up intervention models, the next step is to show that ADT does in fact reduce drinking, sometimes to the extent of abstinence. The most comprehensive overview on the effects of alcoholism treatment is in Hester and Miller’s seminal 2003 report on approaches and their effectiveness.[153] Other reviews (see references 103 and 154), plus analyses on individual forms of treatment (such as the Cochrane reviews described below) also support the conclusion that effective forms of treatment can reduce drinking levels and lead to abstinence.

Our next step was to select the treatment interventions for our simulation study. We took the most effective approaches (according to the league table in the main systematic review[153]), and estimated effect sizes based on Cochrane meta-analyses. (In the case of CBT, where no Cochrane review was available, we used the most recent meta-analysis.) The following AD therapies were selected:

- **Cognitive-Behavioural Therapy (CBT).** A form of psychological treatment with a comprehensive theory of psychopathology and personality, and specific models for various disorders. The therapy requires an empathetic clinician, who actively collaborates with patients in structured sessions to define their treatment goals. The goal is to reduce symptoms, and for patients to learn the cognitive and behavioural skills to cope with their disorder.

- **Motivational Interviewing (MI)**. A directive, client-centred counselling style, with the goal of eliciting behavioural changes in clients by helping them to explore and resolve their ambivalent thinking patterns.

- **Brief Interventions (BIs)**. Short, one-on-one counselling sessions that are ideally suited for people who drink in a harmful or abusive way. These typically consist of one to four short counselling sessions with a trained interventionist (e.g., physician, psychologist, social worker). They generally aim to moderate a person's alcohol consumption to sensible levels, and to eliminate harmful practices such as binge drinking.

- **Pharmacology**. This approach is usually combined with counselling. We modelled the effectiveness of this treatment based on the most recent Cochrane reviews of acamprosate and opioid antagonist treatment.[158-159]

Table 11, on the next page, gives an overview of the types and sizes of treatment effects. (In order to assess the effect of therapeutic interventions at the population level, we selected information on their overall success. We compared the results before and after therapy, or between treated populations and non-treated control groups.)

Table 11: Assumptions for modelling interventions

The table below gives an overview of the assumptions behind our modelling of treatment interventions.

<table>
<tr><th>Interventions</th><th>Main results on exposure
(effects assumed to be stable for 1 year)</th><th>Risk relations</th><th>Source</th></tr>
<tr><td>MI and CBT 1</td><td>For MI, an average drop of 15.8 g of pure alcohol per day was assumed (measured against no intervention; 95% CI from -9.6 g to -21.8 g of pure alcohol). The effect after one year was very small and not significant (average: 1.2 g pure alcohol reduction per day), the average effect over the year was a 3.2 g reduction of pure alcohol per day (95% CI: -1.2 g to -5.2g pure alcohol per day).
For CBT, almost the same effect was found in studies with a no-treatment control as the comparison condition (15.9 g of pure alcohol per day). In addition, Project Match did not find any significant differences[160] between MI and CBT.
We modelled the results based on a drop 15.8 g/day over the year.</td><td rowspan="5">The usual dose-dependent risk relations between average consumption of alcohol and disease outcomes were used, multiplied by 2 to account for the overall higher mortality risk of people with AD.[110] For injury, the same RR was used for AD; and for non-dependent people, the RR from reference 161 was used.</td><td>MI: reference 162
CBT: reference 163</td></tr>
<tr><td>MI and CBT 2</td><td>An average drop of 21.8 g of pure alcohol per day was assumed as the upper limit of the CI for MI/CBT (see above). We assumed proportional CIs compared to the first MI/CBT scenario.</td><td>reference 162</td></tr>
<tr><td>BI 1</td><td>An average drop of 13.5 g of pure alcohol per day with a 95% CI from -2.7 to -24.5 of pure alcohol.</td><td>references 147 and164</td></tr>
<tr><td>BI 2</td><td>An average reduction of the RR for mortality by 0.6 (95% CI: 0.40 to 0.91). This scenario represents the “best case” for BI, as hospitalization is linked to mortality, and AD plays an important role in mediating and moderating this premature mortality (e.g. references 165-166). However, similar effects were obtained in a meta-analysis of all BIs.[167]</td><td>reference 147</td></tr>
<tr><td>Pharmacological therapy (for simulation, the effects of RCTs on acamprosate and opioid antagonist treatment were combined</td><td>Overall, for 55.0% of the patient population a reduction in drinking by 13% on average; for 18.1% of the patient population a reduction in drinking by 50%; and for 26.8% of the population abstinence.</td><td>Pooled estimates of references 158 and 159. For this simulation we are concerned about the differences in consumption between baseline and follow-up in the group receiving medications only.</td></tr>
</table>

It should be noted that the underlying randomized controlled trials for psychotherapies did not require a diagnosis of AD as an inclusion criterion in all cases. This is especially true for BIs, which are designed for problem drinkers and heavy alcohol users—most of whom may not qualify for AD. As a result, the effects of psychotherapeutic intervention may be overestimated. Furthermore, there is some question about whether the results of randomized clinical trials can be generalized to a potential treatment rate of 40% of all people with AD, even though we selected only from the more severe cases. This question touches on the overall issue of efficacy versus effectiveness.[168] The samples in the randomized trials are different from community samples with AD;[169] but it is hard to predict what this means in terms of outcome. At this point, we can only indicate this potential bias in our estimations.

The statistical model for estimating intervention effects

As presented above, the interventions can be interpreted as downward shifts in the daily alcohol intake, or as decreases of the RR associated with alcohol consumption. The modelling of the intervention effects was achieved by applying these effects to simulated populations for each country. The analysis of each intervention was carried out assuming that different proportions of all people with AD—10%, 20%, 30% and 40%—would undergo treatment. The details of the statistical method used can be found in Web Appendix 17.

The distribution of abstainers and drinkers

Figure 17 shows the resulting simulation of the EU population distribution, for men only, with respect to alcohol consumption before and after the interventions. (Data for women are included in Figure 18, below.) Only one intervention scenario, the most effective, was selected to demonstrate the methodology; its effects can be better traced in the graphs on the next page.

Figure 17: Alcohol consumption in men with AD, before and after intervention

The figure below indicates the population distribution for average daily consumption of alcohol, before and after intervention, for 40% of men with AD.

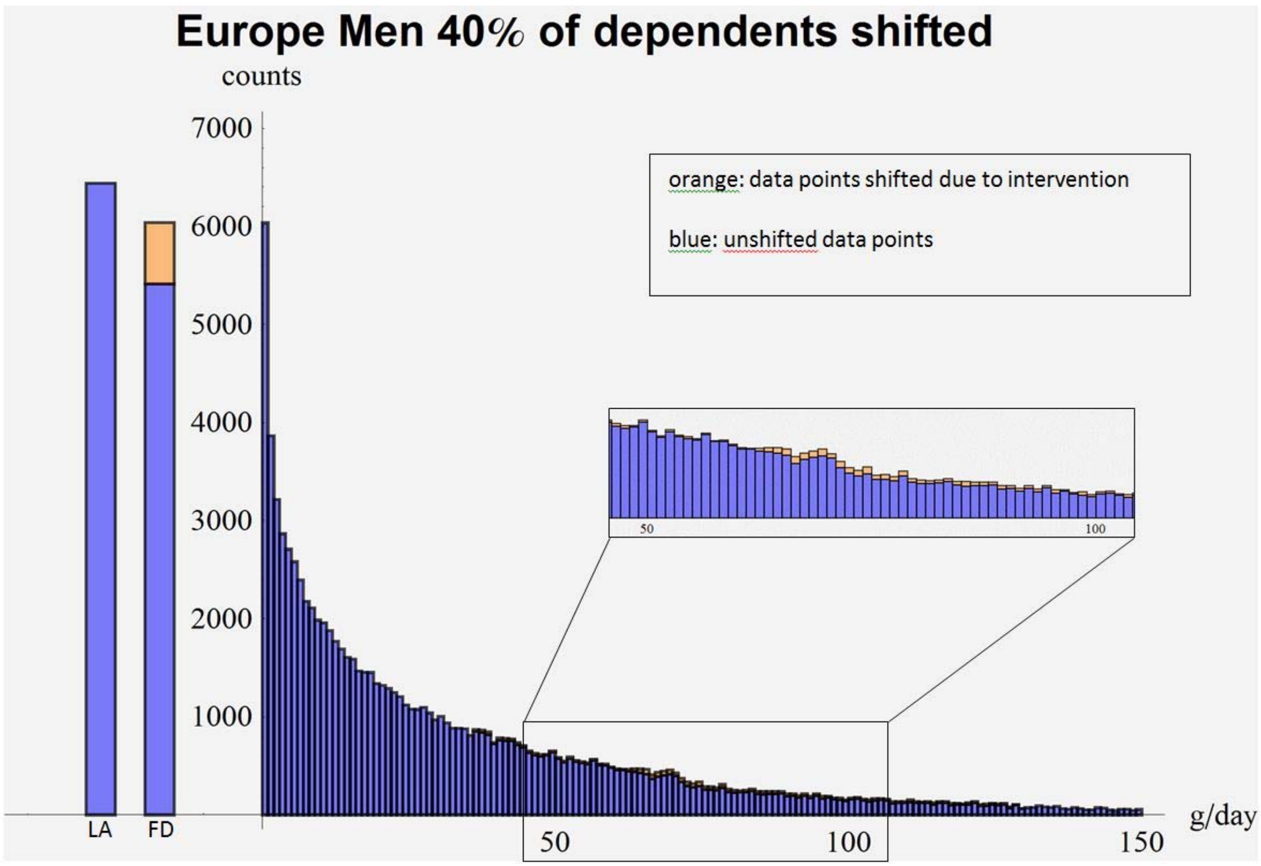
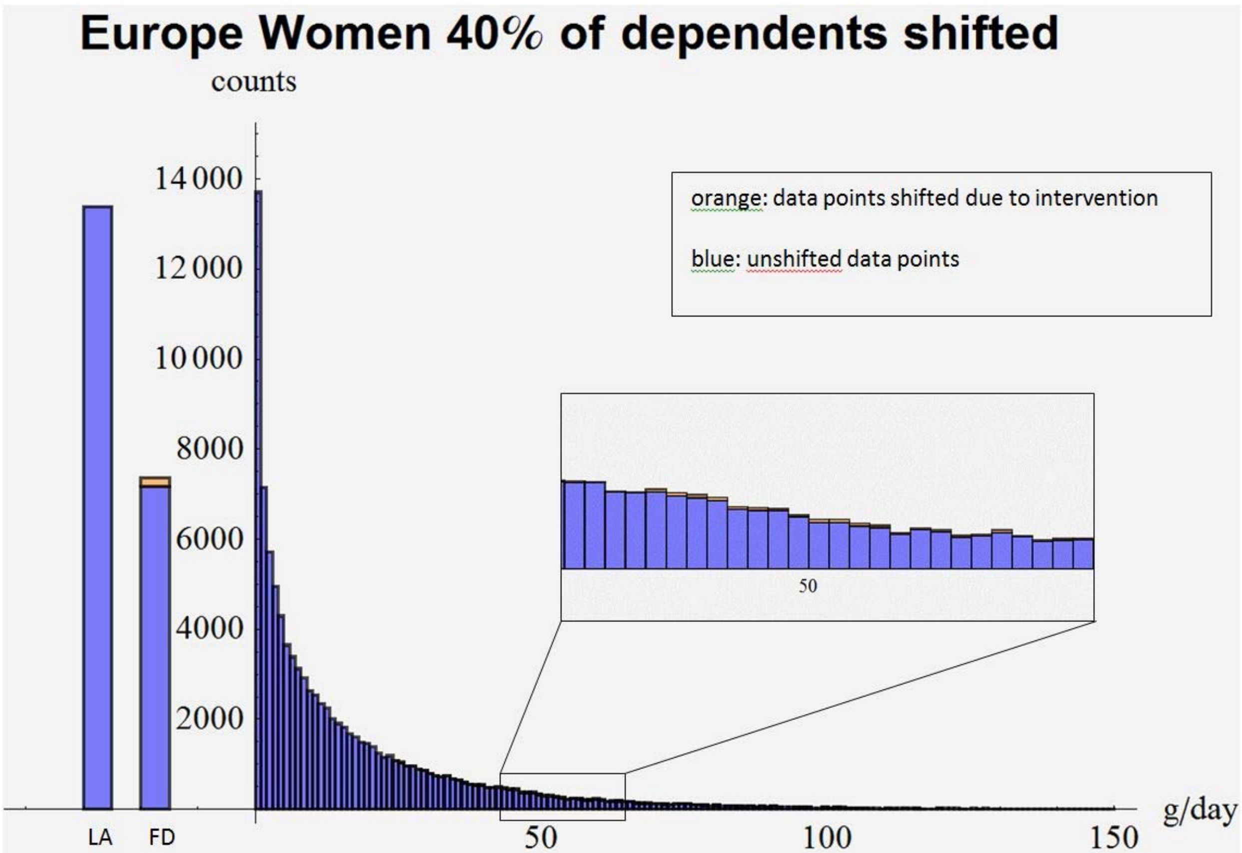


Figure 18, below, shows the same distribution for women. Based on the fact that there are proportionally more men with AD than women at the population level, the consequences of the intervention in terms of shifting to a different drinking category are much more pronounced in men.

Figure 18: Alcohol consumption in women with AD, before and after intervention

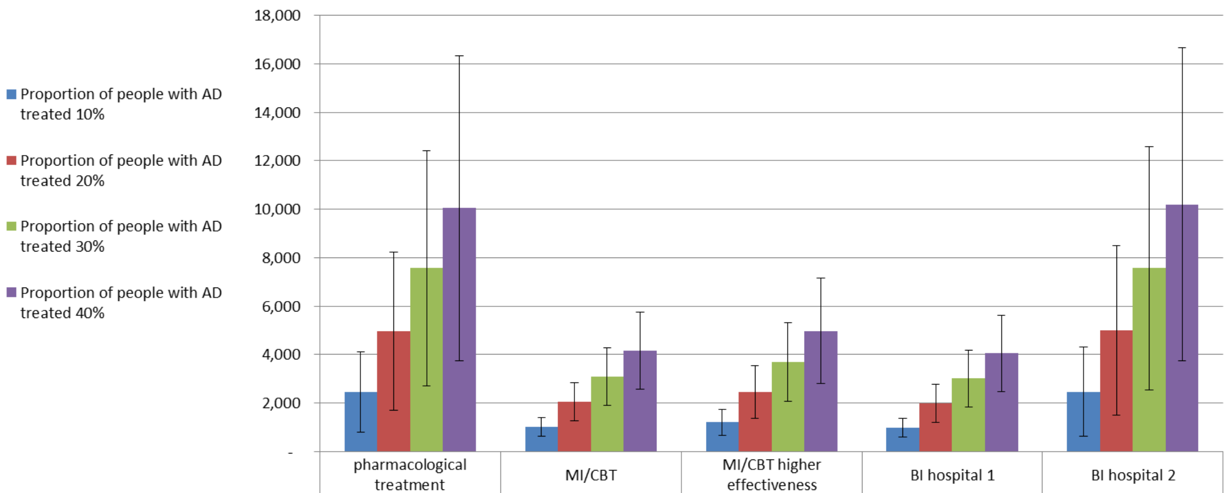
The figure below indicates the population distribution for average daily consumption of alcohol, before and after intervention, for 40% of women with AD.



Deaths avoided due to interventions

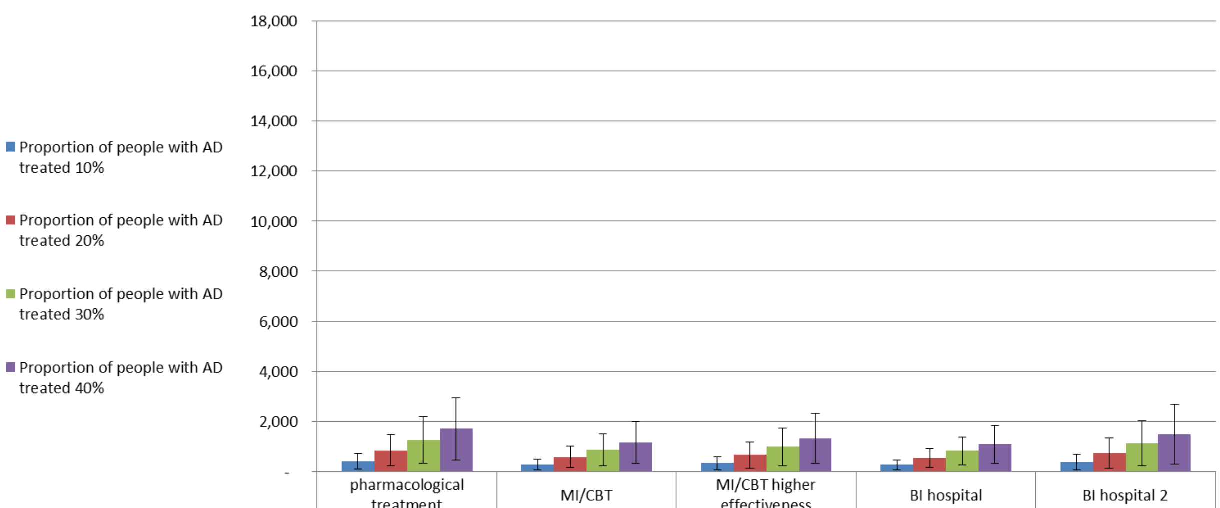
Figures 19a and 19b provide an overview of deaths avoided over the course of a year in the EU, in the age group 15-64, due to treatment for AD.

Figure 19a: Deaths avoided in men



	pharmacological treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital 1	BI hospital 2
Proportion of people with AD treated 10%	2,459	1,020	1,217	995	2,472
Proportion of people with AD treated 20%	4,980	2,051	2,452	2,000	4,994
Proportion of people with AD treated 30%	7,564	3,105	3,698	3,014	7,563
Proportion of people with AD treated 40%	10,040	4,160	4,985	4,051	10,196

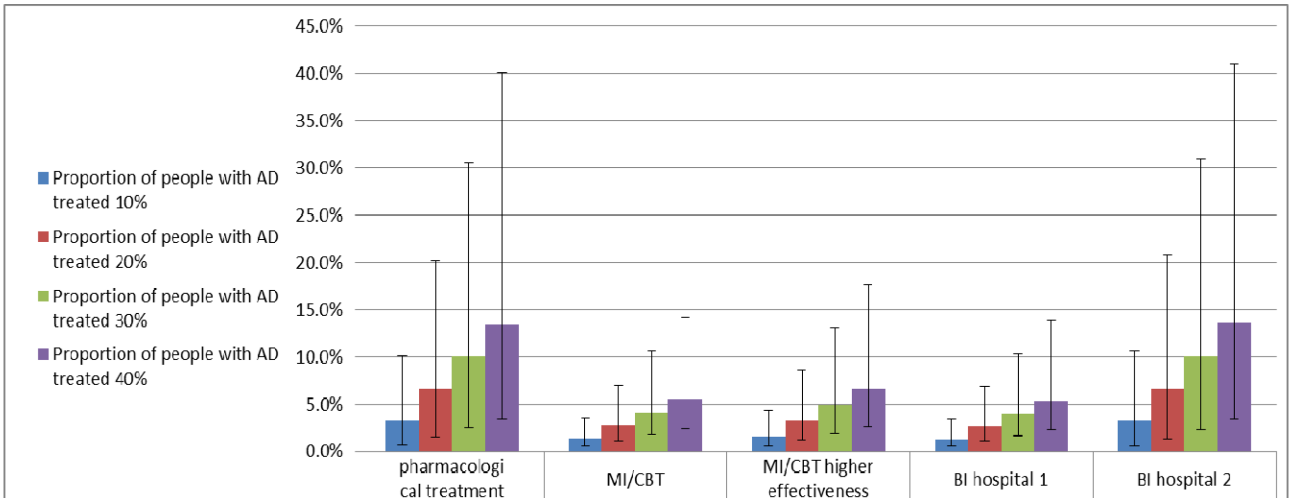
Figure 19b: Deaths avoided in women



	pharmacological treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital	BI hospital 2
Proportion of people with AD treated 10%	416	284	324	266	369
Proportion of people with AD treated 20%	838	573	651	540	739
Proportion of people with AD treated 30%	1,269	857	985	813	1,111
Proportion of people with AD treated 40%	1,704	1,148	1,315	1,080	1,492

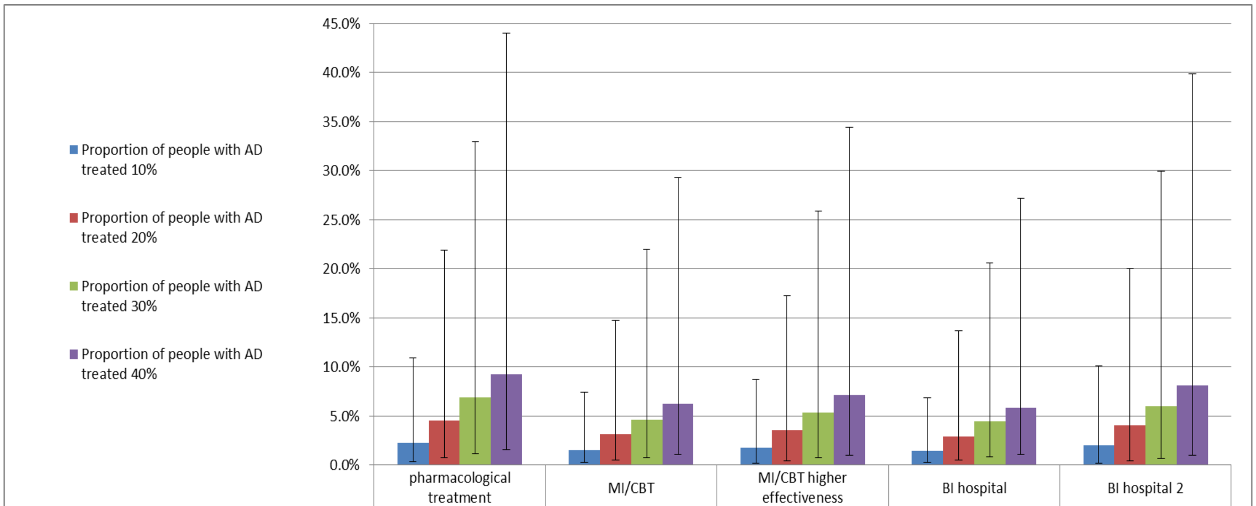
Assuming that 40% of people with AD are treated, and assuming that the average effectiveness of treatment is as specified in recent Cochrane reviews, we can estimate that about 10,000 deaths of men could be avoided with pharmacological treatment, and more than 1,700 deaths of women (all data are for the age group 15-64 in the EU). This difference between sexes is due to the assumption that 5.4% of men fulfilled the minimum criteria for AD, but only 1.5% of women. In addition, the all-cause mortality rate of women is markedly lower than that of men. As indicated above, no differential effects are assumed with respect to treatment effectiveness. Brief interventions for heavy drinkers who are also acute-care hospital patients yield almost the same number of deaths avoided (Figures 19a and 19b, intervention BI hospital 2), whereas the other two treatments are associated with a considerably smaller numbers of deaths avoided. While the number of women's deaths avoided by any given treatment is only up to 30% of the men's deaths avoided, the proportional differences are much smaller. These numbers are outlined in Figures 20a and 20b, below, which show the proportion of alcohol-attributable deaths avoided in men and women, over the course of a year, by treatment for AD.

Figure 20a: Deaths avoided in men



	pharmacological treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital 1	BI hospital 2
Proportion of people with AD treated 10%	3.3%	1.4%	1.6%	1.3%	3.3%
Proportion of people with AD treated 20%	6.6%	2.7%	3.3%	2.7%	6.6%
Proportion of people with AD treated 30%	10.0%	4.1%	4.9%	4.0%	10.0%
Proportion of people with AD treated 40%	13.3%	5.5%	6.6%	5.4%	13.5%

Figure 20b: Deaths avoided in women

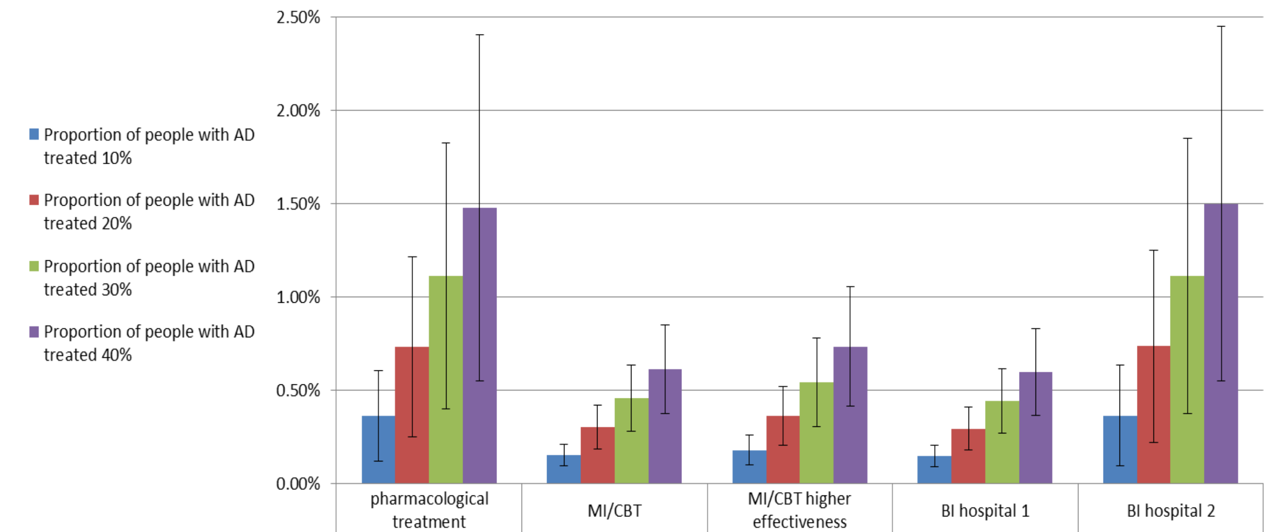


	pharmacological treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital	BI hospital 2
Proportion of people with AD treated 10%	2.3%	1.5%	1.8%	1.4%	2.0%
Proportion of people with AD treated 20%	4.6%	3.1%	3.5%	2.9%	4.0%
Proportion of people with AD treated 30%	6.9%	4.7%	5.3%	4.4%	6.0%
Proportion of people with AD treated 40%	9.3%	6.2%	7.1%	5.9%	8.1%

The resulting changes in overall mortality for the EU are summarized in Figures 21a and 21b, below. In the most successful scenario, 1.48% of all deaths could be saved in one year in Europe if 40% of all people with AD were treated with pharmacotherapy. It is clear that proportionally the most alcohol-attributable deaths can be saved by treatment in the Nordic countries. (Country data are displayed in the respective country reports, and regional data in Web Appendix 18.)

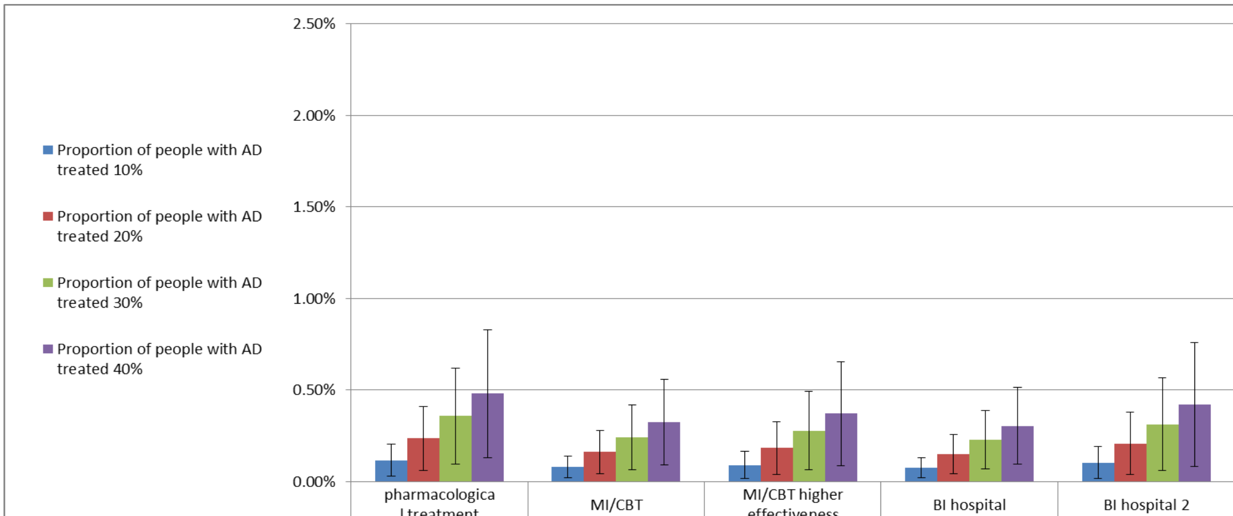
On the next page, Figures 21a and 21b show the proportion of alcohol-attributable deaths to all deaths, avoided over one year by treatment for AD.

Figure 21a: Deaths avoided in men (as a proportion of all deaths)



	pharmacological treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital 1	BI hospital 2
Proportion of people with AD treated 10%	0.36%	0.15%	0.18%	0.15%	0.36%
Proportion of people with AD treated 20%	0.73%	0.30%	0.36%	0.29%	0.73%
Proportion of people with AD treated 30%	1.11%	0.46%	0.54%	0.44%	1.11%
Proportion of people with AD treated 40%	1.48%	0.61%	0.73%	0.60%	1.50%

Figure 21b: Deaths avoided in women (as a proportion of all deaths)



	pharmacologica l treatment	MI/CBT	MI/CBT higher effectiveness	BI hospital	BI hospital 2
Proportion of people with AD treated 10%	0.12%	0.08%	0.09%	0.08%	0.10%
Proportion of people with AD treated 20%	0.24%	0.16%	0.18%	0.15%	0.21%
Proportion of people with AD treated 30%	0.36%	0.24%	0.28%	0.23%	0.31%
Proportion of people with AD treated 40%	0.48%	0.32%	0.37%	0.30%	0.42%

Conclusions for Alcohol Policy

> Treatment for alcohol dependence should be made available at much lower thresholds than at present; and it should be an additional policy option, supplementing other current alcohol policy measures (such as taxation, bans on advertising, and drunk-driving measures).

Alcohol policy has become the focus of attention globally in recent years, especially since the adoption of the WHO global strategy to reduce the harmful use of alcohol.[170] This strategy focuses on ten key areas of policy options and interventions at the national level:

- leadership, awareness and commitment
- responses by health services
- community action
- drunk-driving policies and countermeasures
- limiting the availability of alcohol
- limiting the marketing of alcoholic beverages
- pricing policies
- reducing the negative consequences of drinking and intoxication
- reducing the public-health impact of illicit alcohol
- monitoring and surveillance.

Most of these policies focus on preventing harmful alcohol consumption, and are based on the growing literature on cost-effective measures to prevent alcohol-attributable harms.[11;13;171-172] Their underlying assumption is that reductions in a society's overall rate of drinking will lead to reductions in heavy drinking and alcohol-related harm. The evidence for this assumption is strong. One example concerns pricing policies, specifically the impact of taxation on pricing. Wagenaar and colleagues conducted two meta-analyses, and found that the price of alcohol is inversely related not only to consumption,[173] but also to morbidity and mortality.[174] Their findings suggest that doubling taxation on alcohol would reduce related mortality by an average of 35%, traffic deaths by 11%, sexually transmitted diseases by 6%, violence by 2%, and crime by 1.4%. However, the main problem with such policies is that they are quite unpopular in today's political environment. European governments fear that taxpayers will perceive them as penalizing the majority of drinkers (those with low to moderate consumption rates)—so not many governments will consider doubling taxes.

However, the WHO's second target area—response by health services—includes offering prevention and treatment interventions to individuals and families affected by AUD and associated conditions (see reference 170). The philosophy of the global strategy is to build upon and expand the various iterations of the European Alcohol Action Plan. These plans have been implemented to reach Europe's target goals, in all its member states, of significantly reducing the adverse health effects of consuming addictive substances such as tobacco, alcohol and psychoactive drugs. (This is the current iteration of the goals adopted by the WHO Regional Committee for Europe at its 48th session, in Copenhagen, Denmark, in September 1998.) The first European Alcohol Action Plan dates back to 1993,[x] and the current European Alcohol Action Plan 2012–2020 has just been accepted.[xi] At the influential conference in Paris in 1995, the overall goal for alcohol policy of the WHO Regional Office was "Less is better"; and the interventions suggested to reduce alcohol-attributable harm were subsumed under this goal (see references 175 and 176). As with its global strategy, the WHO focuses on alcohol policies for prevention, as they are considered to be the most cost-effective.[175]

The EU's strategy to reduce alcohol-related harms[xii] had different foci:

- protecting young people and children
- preventing drunk-driving
- reducing alcohol-related harm among adults
- raising awareness
- collecting reliable data

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x See online:
http://www.api.or.at/sp/alcoholpolicy%20dokumente/european%20alcohol%20action%20plan%201993.pdf
xi See online: http://www.euro.who.int/__data/assets/pdf_file/0006/147732/wd13E_Alcohol_111372.pdf
xii See online:
http://europa.eu/legislation_summaries/public_health/health_determinants_lifestyle/c11564b_en.htm

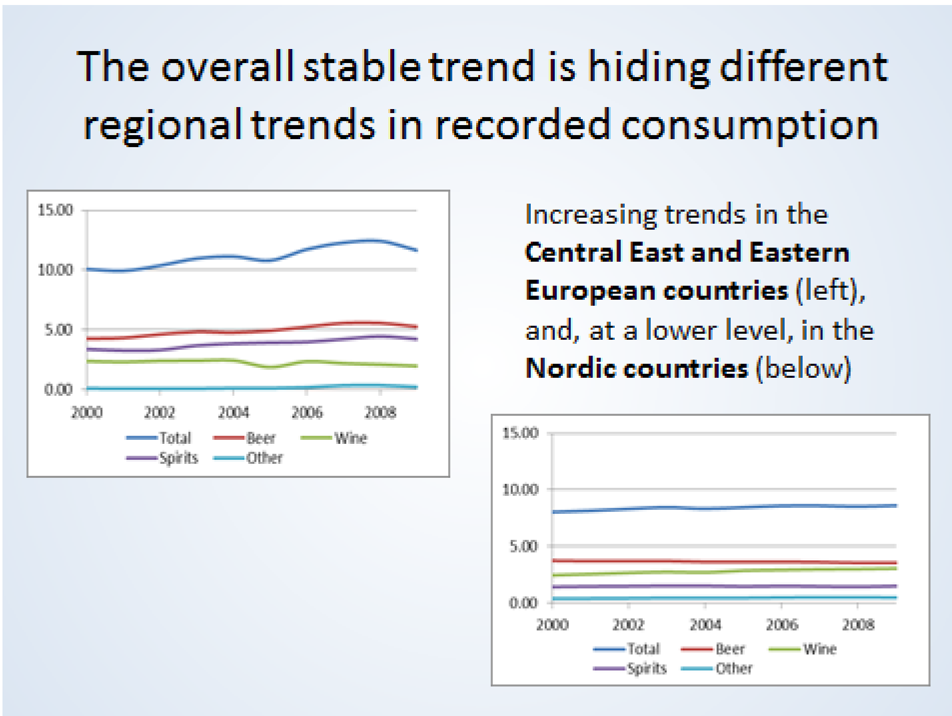
The effectiveness of the strategy to reach its outcomes is currently being evaluated. Treatment and systems do not figure in this strategy, presumably because the responsibilities for them are at the national level.

In conclusion, we may assume that treatment of AD does not play a prominent role in the current strategies of either the WHO or the EU. The public-health benefits of improving treatment rates, and providing appropriate services, seem to be overlooked. However, given the size of the health and social burdens that are linked to AD, we suggest that it should be made a priority to supplement the current capacity for treating this disorder.

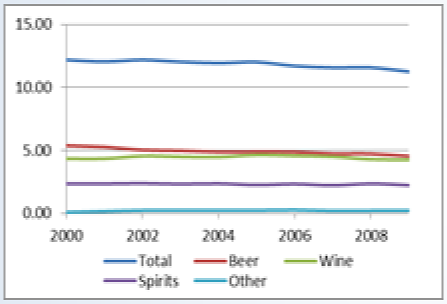
As indicated above, there is sufficient evidence of the effectiveness of ADT.[171;172;175] In addition, there is an ethical obligation for European countries to help those who are currently suffering. The simulations of interventions outlined above demonstrate that ADT not only helps the individuals affected, but also substantially improves public health in general. So even though ADT may be less cost-effective than other strategies in terms of avoiding the future burden of alcohol- attributable disease, it is a necessary complement to other policies. Put together, all these strategies could help to markedly decrease Europe's alcohol-related burden.

Web Appendix 1: Adult Alcohol Consumption

The following graphics represent Europe's regional trends in recorded adult (15+) alcohol consumption per capita, since 2000.

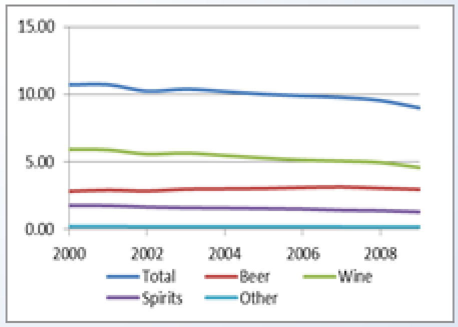


….. and decreasing trends in Central West and Southern European countries



Central West and Western region

Southern region



Web Appendix 2: Estimating the Alcohol-Attributable Burden

This section examines the methods used to estimate the alcohol-attributable burden of disease, for diseases not wholly attributable to alcohol.

Modelling average consumption

Average alcohol consumption among general populations can be modelled using a gamma distribution,[8;177] as follows:

$$f(x;k,\theta) = \frac{x^{k-1}}{\Gamma(k)}\theta^{-k}\exp\left\{-\frac{x}{\theta}\right\} \quad \textit{for} \quad x > 0 \textit{ and } k,\theta > 0$$

where $\Gamma(k) = \int_0^\infty x^{k-1}e^{-x}dx$ is the gamma function.

The scale parameter θ and a shape parameter κ are linked to the mean and standard deviation of the function by:

$$\theta = \frac{\sigma^2}{\mu} \textit{ and } \kappa = \frac{\mu^2}{\sigma^2}$$

Hence,

$$\mu = \kappa\theta \quad \textit{and } \sigma = \sqrt{\kappa\theta^2}$$

Moreover, it has been shown that there is a linear relationship between the mean and the standard deviation of this gamma distribution in both male and female populations.[8] By knowing the per capita consumption, it is possible to model the prevalence of the entire drinking population. The proportions of any sub-category of the drinking population (e.g. 60+ g/day) can then be estimated by integrating the gamma distribution for alcohol consumption within set boundaries. For example, the integral of the gamma distribution for average alcohol consumption from 60 g to infinity will be an estimate of the prevalence of current drinkers who consume (on average) 60+ g per day. Previous analyses have shown that capping the distribution does not result in substantially different prevalence estimates; however, it does change the gamma distribution.[8] Summary data on exposure variables are displayed in Table 2, in the main text.

Deriving alcohol-attributable fractions from exposure and RRs

In alcohol epidemiology, the number of deaths caused by consumption is calculated using an Alcohol-Attributable Fraction (AAF). This is defined as the fraction of mortality that would not be present if exposure to alcohol was 0—as in, if every person was a lifetime abstainer.[45;178]

The methodology for calculating several alcohol-attributable factors—number of deaths, potential years of life lost (PYLL), years of life lost due to disability (YLD), and disability-adjusted years of life lost (DALYs)—has two main steps. First, the country-, age-, and sex-specific AAFs are calculated. Then these AAFs are applied to the corresponding mortality, PYLL, YLD and DALYs data.

Step 1: Calculation of AAFs by country, age, and sex

Defining age categories

Three age categories were used based on the 2005 Global Burden of Disease (GBD) study: 15–34, 35–64, and 65 or older. Ages were clustered to be comparable to the 2005 GBD study.[27]

Countries included in the analysis

We used data from all 27 member states of the EU. Population estimates by country for 2004 and 2009 were based on data obtained from the 2008 revisions of the United Nations Population Division.[179]

Sources for modelling risk relations

Sources for RR functions by GBD code are outlined in Web Appendix 3. Alcohol-attributable harms were calculated based on meta-analyses reporting a continuous RR function by dose of exposure. An outline of the causal relationship between alcohol and these GBD code categories is described in detail elsewhere.[40]

AAFs for chronic and infectious diseases (except ischemic heart disease)

AAF calculations were based on the distribution of alcohol consumption; on the prevalence of current drinkers, former drinkers and lifetime abstainers; and on the RR. The calculation was as follows:

$$AAF = \frac{P_{abs} + P_{former} RR_{former} + \int_0^{150} P_{current}(x) RR_{current}(x)dx - 1}{P_{abs} + P_{former} RR_{former} + \int_0^{150} P_{current}(x) RR_{current}(x)dx}$$

where P_{abs} represents lifetime abstainers, P_{former} is the prevalence of former drinkers, RR_{former} is the RR for former drinkers, $P_{current}$ is the prevalence of current drinkers who consume an average amount (x) of alcohol, and $RR_{current}$ is the RR given an average daily consumption of x.

AAFs for ischemic heart disease

The risk for ischemic heart disease is affected by both the average volume of alcohol consumption, and by patterns of drinking.[47-48] For our modelling, we based average volume of consumption on the well-known J-shaped curve (see reference 46, also 180, or 181 for similar results), for all individuals who did not have irregular heavy-drinking occasions (see Table 3, above). For people with at least one irregular heavy drinking occasion per month (see Table 3), we used the RR from the respective meta-analysis,[35] and assumed no cardioprotective effect.

Estimating AAFs for low birth weight

To calculate the AAFs for mortality caused by low birth weight attributable to alcohol consumption, we used a modelling strategy that takes into account the distribution of women who drank the same amount of alcohol during pregnancy as pre-pregnancy, and women who drank less while pregnant. Then we calculated the AAFs for low birth weight as follows:

$$AAF = \frac{P_{abs} + \int_0^{150} P_{same}(x)RR(x)dx + \int_0^{150} P_{less}(x)RR(x)dx - 1}{P_{abs} + \int_0^{150} P_{same}(x)RR(x)dx + \int_0^{150} P_{less}(x)RR(x)dx}$$

where P_{abs} represents the proportion of women who abstained from alcohol while pregnant, P_{same} represents the proportion of women who consumed the same amount as in pre-pregnancy, and P_{less} represents the proportion of women who consumed less than in pre-pregnancy.

Estimating AAFs for injuries

Estimating the AAFs for harms caused to the drinker

We modelled the AAFs for injuries according to a methodology that takes into account two dimensions of alcohol consumption: binge drinking (both the number of occasions, and the amount consumed per occasion), and average daily consumption (on non-binge days). When calculating the AAFs, we also included alcohol metabolism rates (for both men and women) to calculate a person's risk of an injury, according to methods outlined by Taylor and colleagues.[182]

The AAFs for intentional and unintentional injuries attributable to alcohol consumption were calculated as follows:

$$AAF = \frac{P_{abs} + P_{current(non-binge)}RR_{current(non-binge)} + P_{current(binge)}RR_{current(binge)} - 1}{P_{abs} + P_{current(non-binge)}RR_{current(non-binge)} + P_{current(binge)}RR_{current(binge)}}$$

where P_{abs} represents the prevalence of current abstainers; and $P_{current(binge)}$ and $P_{current(non\text{-}binge)}$ are respectively the prevalence of current drinkers who engage in binge drinking, and the prevalence of current drinkers who do not engage in binge drinking. The RRs were calculated separately for both the latter cases. $RR_{current(non\text{-}binge)}$ was calculated as follows:

$$RR_{current(non\text{-}binge)} = (RR_{average} - 1) * P_{non\text{-}bingedays} + 1$$

and $RR_{current(binge)}$ was calculated as follows:

$$RR_{current(binge)} = (RR_{average} - 1) * P_{non\text{-}bingedays} + (RR_{binge} - 1) * P_{bingedays} + 1$$

and where risk on average drinking days ($RR_{average}$) was calculated as follows:

$$RR_{average} = P_{dayatrisk}(x) * (RR_{avg\_non-binge}(x) - 1) + 1$$

and where risk on binge drinking days (RR_{binge}) was calculated as follows:

$$RR_{binge} = P_{dayatrisk}(x) * (RR_{binge}(\mathrm{x}) - 1) + 1$$

and where $P_{dayatrisk}$ represents the proportion of a day at risk, and RR_{binge} and $RR_{current}$ are the relative risks for injury given an amount of alcohol consumed. $P_{dayatrisk}$ is calculated based on the average rate at which alcohol is metabolized.

Since these AAFs were calculated based on samples of emergency patients, we estimated the AAF for mortality from motor-vehicle accidents by multiplying the AAF for morbidity for motor-vehicle accidents by 3/2. Similarly, to estimate the AAF for mortality due to non–motor vehicle accidents, we multiplied the AAF for morbidity for non–motor vehicle accidents by 9/4. These methods were based on two studies that compared blood-alcohol levels of emergency patients with levels obtained from coroners' reports of patients who died from injuries.

For women, the AAF for motor-vehicle accidents was calculated by multiplying the men's AAF for motor-vehicle accidents by the product of the per capita consumption of alcohol for women, divided by the per capita consumption of alcohol for men.

The AAFs for deaths and morbidity caused by drinkers to others due to motor-vehicle accidents were calculated based on recent data reported by Laslett et al., 2011.[74] The AAFs for the alcohol-attributable injuries to others were calculated as follows:

$$AAF_{Otherage} = (1 - AAF_{selfagecountryi})*\left(1 - \exp\left[\ln\left(1 - AAF_{otherageAustralia}\right)* \frac{AAF_{selfcounrtyi}}{AAF_{selfAustralia}}\right]\right)$$

where $AAF_{othersage}$ represents the AAF for motor-vehicle accident injuries caused by others, $AAF_{selfcountryi}$ represents the AAF for motor-vehicle accident injuries caused to oneself for an entire country, and $AAF_{selfagecountryi}$ represents the AAF for motor-vehicle accident injuries caused to oneself for each specific age group. $AAF_{selfAustralia}$ represents the AAF for motor-vehicle accident injuries caused to oneself in Australia, and $AAF_{otherageAustralia}$ represents the AAF for motor-vehicle accident injuries caused by others for each specific age group in Australia.

The AAFs for deaths and injuries caused by an assault by someone who has been drinking were calculated based on recent data reported by Laslett et al., 2011.[74] These AAFs were calculated as follows:

$$AAF_{Othersage} = AAF_{othersageAustralia} * \left(\frac{AAF_{selfcountryi}}{AAF_{selfAustralia}}\right)$$

where $AAF_{othersage}$ represents the AAF for deaths or injuries caused by assaults, $AAF_{selfcountryi}$ represents the AAF for deaths or injuries caused by assaults for an entire country, and $AAF_{selfageAustraliai}$ represents the AAF for deaths or injuries caused by assaults for each specific age group in Australia, and $AAF_{selfAustralia}$ represents the AAF for deaths or injuries caused by assaults in Australia.

Estimating AAFs due to heavy drinking

The prevalence of per capita consumption was estimated using a gamma function, normalized to 1 if integrated from 0 to 150 g of pure alcohol/day. This is equivalent to a cap at 150 g/day in raw data.

The "Heavy Drinker Attributable Fraction" (HDAF), i.e. the fraction of deaths or DALYs attributable to heavy drinking, is defined as follows:

$$HDAF = \frac{c \bullet P_{form} + \int_{x_1}^{150} P(x)RR(x)\,dx - (c \bullet P_{form} + \int_{x_1}^{150} P(x)\,dx)}{P_{abs} + P_{form}RR_{form} + \int_{0}^{150} P(x)RR(x)\,dx}$$

where P_{form} represents the proportion of former drinkers, P(x) represents the prevalence of drinking a daily amount of alcohol x, P_{abs} represents the proportion of abstainers, RR_{form} represents the RR for former drinkers, and RR(x) represents the RR for drinkers associated with a daily alcohol intake of x. The variable x_1 is the threshold after which a drinker is considered a heavy drinker. In our case, x_1 is 60 g/day for men and 40 g/day for women.

Estimating the proportion of current heavy drinkers and their risk is simple; it is only necessary to integrate the prevalence-risk ratio product from a certain minimum amount (x_1) to 150. However, the proportion of deaths attributable to former drinkers who were once heavy drinkers is not straightforward. An estimate of the proportion of former drinkers was obtained by considering this fact: that the ratio of harm in current heavy drinkers, with respect to the total consuming population, is the same as the harm of former heavy drinkers with respect to the total former drinkers. Thus, the factor c in the above formula can be defined as:

$$c = \frac{\int_{x_1}^{150} P(x)RR(x)dx}{\int_{0}^{150} P(x)RR(x)dx}$$

This assumes that the proportion of harm is accounted for only by the proportion of former heavy drinkers, and not by a change in the RR. These HDAFs were then applied to the numbers for mortality and DALYs for each EU country, as well as for Norway, Russia, Iceland and Switzerland.

Estimating confidence intervals for the AAFs

To calculate the 95% confidence intervals (CIs) for the AAFs, we used a Monte Carlo–type approach—described by Gmel and colleagues[183] for chronic and infectious diseases, and by Taylor and colleagues[182] for injuries. To estimate the variance for each AAF, we generated 40,000 sets of the lowest-level parameters, and then used these sets to calculate 40,000 AAFs. From these AAFs we calculated the variances, which were then used to calculate the 95% CIs. (All statistical analyses and modelling were performed using R version 2.11.1.)

Step 2: Application of the AAFs to region-specific mortality, PYLL, YLD and DALYs data

For this step, we multiplied specific AAFs—by country, age and sex—by each of the figures for alcohol-attributable mortality, PYLL, YLD, and DALYs.

Estimating mortality and morbidity

We used an event-based measure (mortality) and time-based measures (PYLL, YLD and DALYs) to quantify the burden of injuries.[184] DALYs combine PYLL and YLD. Comprehensive revision estimates for 2004 of mortality, PYLL, YLD and DALYs for the 160 GBD disease and injury categories were provided by the WHO. Estimates of mortality, PYLL, YLD and DALYs were available for each country.

The mortality, PYLL, YLD and DALYs estimates for 2004 were based on an analysis of the latest available national information concerning levels of mortality and cause distributions, as of the end of 2007; and on the latest available information from the WHO, concerning 35 causes of death and burden of disease with public-health importance. Standardized rates for mortality data were calculated using the 2006 revision of the 2004 population estimates of WHO member states, prepared by the UN Population Division.[185]

Years of Life Lost (YLL) were calculated as the number of cause-specific deaths, multiplied by a global figure reflecting standard life-expectancy, i.e. the usual age of death.[104;186] YLD were estimated in order to measure the impact of disease and injury. To estimate YLD for a particular injury or disease during a particular time period, the number of incident cases in that period were multiplied both by the average duration of the injury or disease; and by a weight factor that reflected the severity of the resulting health state—on a scale from 0 (perfect health) to 1 (death). Both YLL and YLD took into account social preferences.[104] For the YLL and YLD estimates, 3% time discounting and non-uniform age weights were applied. For example, applying discounting and age weights, a death in infancy corresponded to 33 YLL, and a death at an age between 5 and 20 corresponded to around 36 YLL.[187] Full details on data, methods and cause categories for mortality, PYLL, YLD and DALYs are described elsewhere.[104;188]

Web Appendix 3: Sources for Determining Risks for Disease Categories

This table outlines the categories of alcohol-attributable diseases, plus the sources used for determining the risk relations of each disease.

Condition	ICD-10 Code	Source for AAF
Infectious and parasitic diseases		
Tuberculosis	A15-A19	See reference 189; for causal relationship, see 190
HIV/AIDS	B20-B24	See reference 191, for an estimate of the effect of alcohol on worsening treatment outcomes by disrupting medication schedules
Malignant neoplasms		
Mouth and oropharynx cancer	C00-C14	See references 192–193 (based on Relative Risks from reference 161)
Esophageal cancer	C15	See references 192–193 (based on Relative Risks from reference 161)
Liver cancer	C22	See references 192–193 (based on Relative Risks from reference 161)
Laryngeal cancer	C32	See references 192–193 (based on Relative Risks from reference 161)
Breast cancer	C50	See references 192–193 (based on Relative Risks from reference 161)
Colon cancer	C18	See references 192–193 (based on Relative Risks from reference 161)
Rectal cancer	C20	See references 192–193 (based on Relative Risks from reference 161)
Diabetes		
Diabetes mellitus	E10-E14	See reference 194
Neuropsychiatric conditions		
Alcoholic psychosis (part of AUD)	F10.0, F10.3-F10.9	100% AAF per definition
Alcohol abuse (part of AUD)	F10.1	100% AAF per definition
Alcohol dependence (part of AUD)	F10.2	100% AAF per definition
Epilepsy	G40-G41	See reference 195
Cardiovascular diseases		
Hypertensive disease	I10-I15	See reference 196
Ischemic heart disease	I20-I25	See reference 46 for volume; 35 for pattern
Cardiac arrhythmia	I47-I49	See reference 197
Ischemic stroke	I60-I62	See reference 198
Hemorrhagic/other non-ischemic stroke	I63-I66	See reference 198

Digestive diseases			
	Cirrhosis of the liver	K70, K74	See reference 61
	Acute and chronic pancreatitis	K85, K86.1	See reference 199
Respiratory infections			
	Lower respiratory infection	J10–J18, J20–J22	See reference 200
Conditions arising before birth			
	Low birth weight (as defined by the GBD)	P05-P07	See reference 201
Unintentional injuries			
	Motor-vehicle accident	§	See reference 202 for Relative Risk; methodology adopted from 182
	Poisoning	X40-X49	See reference 202 for Relative Risk; methodology adopted from 182
	Falling	W00-W19	See reference 202 for Relative Risk; methodology adopted from 182
	Fires	X00-X09	See reference 202 for Relative Risk; methodology adopted from 182
	Drowning	W65-W74	See reference 202 for Relative Risk; methodology adopted from 182
	Other unintentional injury	†Rest of V-series and W20-W64, W 75-W99, X10-X39, X50-X59, Y40-Y86, Y88, and Y89	See reference 202 for Relative Risk; methodology adopted from 182
Intentional injuries			
	Self-inflicted injury	X60-X84 and Y87.0	See reference 202 for Relative Risk; methodology adopted from 182
	Homicide	X85-Y09, Y87.1	See reference 202 for Relative Risk; methodology adopted from 182
	Other intentional injury		See reference 202 for Relative Risk; methodology adopted from 182

§ V021–V029, V031–V039, V041–V049, V092, V093, V123–V129, V133–V139, V143–V149, V194–V196, V203–V209, V213–V219, V223–V229, V233–V239, V243–V249,V253–V259, V263–V269, V273–V279, V283–V289, V294–V299, V304–V309, V314–V319, V324–V329, V334–V339, V344–V349, V354–V359, V364–V369, V374–V379, V384–V389, V394–V399, V404–V409, V414–V419, V424–V429, V434–V439, V444–V449, V454–V459, V464–V469, V474–V479, V484–V489, V494–V499, V504–V509, V514–V519, V524–V529, V534–V539, V544–V549, V554–V559, V564–V569, V574–V579, V584–V589, V594–V599, V604–V609, V614–V619, V624–V629, V634–V639, V644–V649, V654–V659, V664–V669, V674–V679, V684–V689, V694–V699, V704–V709, V714–V719, V724–V729, V734–V739, V744–V749, V754–V759, V764–V769, V774–V779, V784–V789, V794–V799, V803–V805, V811, V821, V830–V833, V840–V843, V850–V853, V860–V863, V870–V878, V892.
†Rest of V = V-series MINUS §.

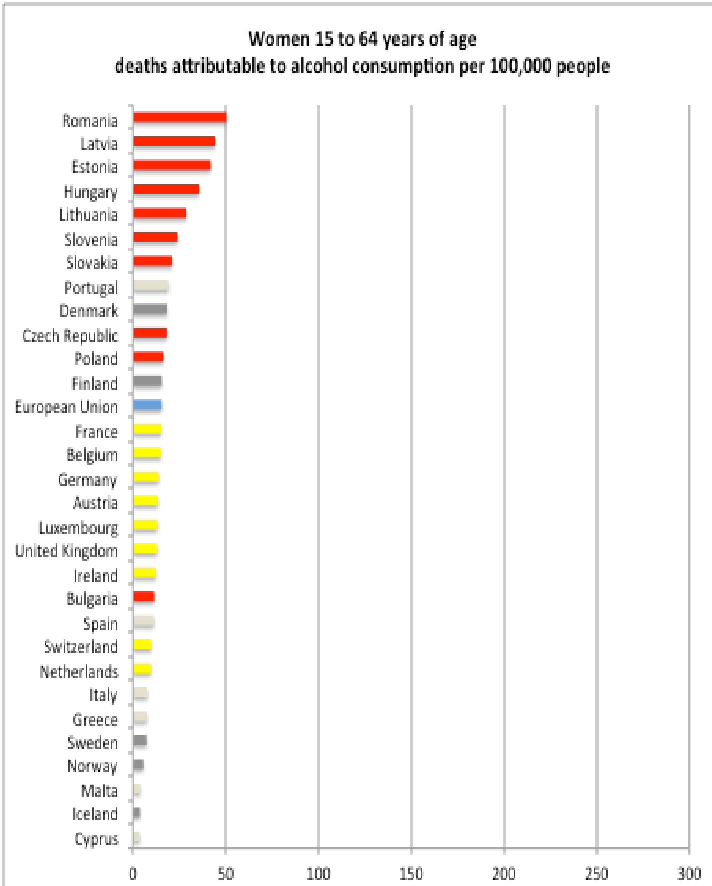
Web Appendix 4: Confidence Intervals for Estimates of Mortality

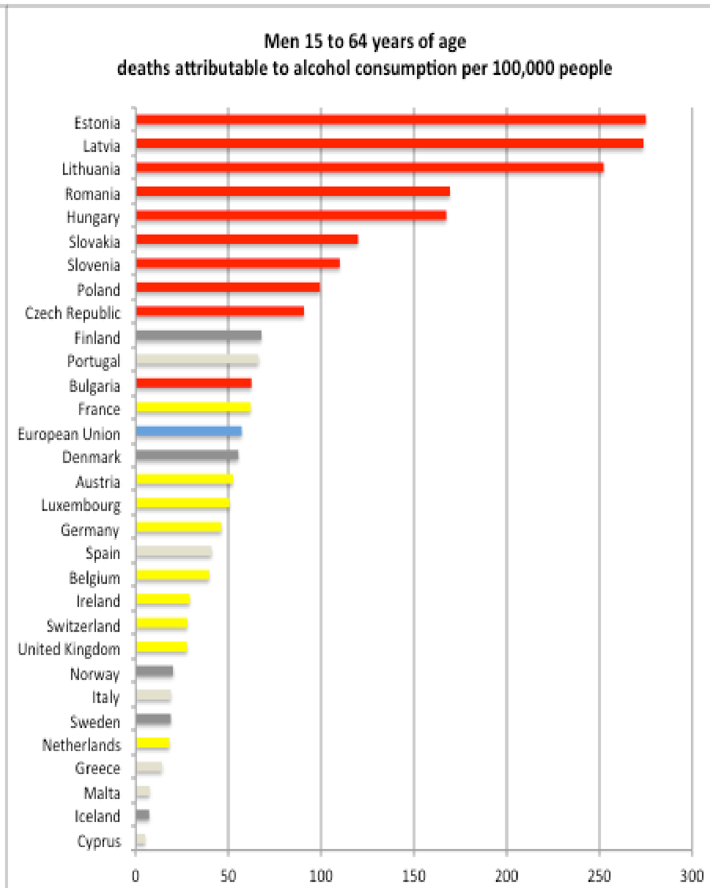
This table outlines the Confidence Intervals for all estimates of alcohol-attributable mortality, by sex, for people aged 15–64 living in European countries in 2004.

	Women			Men			Total		
Countries	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate
Austria	383	202	560	1,543	964	2,114	1,925	1,167	2,674
Belgium	513	237	785	1,385	760	1,998	1,898	997	2,783
Bulgaria	302	-139	734	1,620	646	2,575	1,922	507	3,309
Cyprus	10	-6	25	14	-16	42	24	-22	67
Czech Republic	642	222	1,055	3,199	1,851	4,246	3,842	2,072	5,302
Denmark	338	176	497	1,037	681	1,388	1,375	857	1,885
Estonia	194	106	281	1,153	764	1,464	1,347	870	1,746
Finland	276	46	503	1,235	419	2,044	1,511	465	2,547
France	2,998	1,898	4,089	12,284	8,401	16,134	15,282	10,298	20,223
Germany	3,953	1,859	6,001	13,625	8,649	18,505	17,578	10,508	24,506
Greece	272	29	511	529	11	1,033	802	40	1,544
Hungary	1,232	584	1,867	5,483	3,835	7,114	6,716	4,419	8,981
Iceland	3	-2	9	7	-8	22	10	-11	31
Ireland	155	66	242	395	150	636	550	216	878
Italy	1,525	282	2,749	3,794	1,467	6,070	5,320	1,749	8,819
Latvia	356	136	573	2,011	1,335	2,244	2,366	1,472	2,817
Lithuania	339	157	518	2,741	1,784	3,634	3,080	1,941	4,152
Luxembourg	20	3	37	80	38	122	101	42	159
Malta	5	-3	13	10	-3	23	15	-6	36
Netherlands	539	250	823	1,049	474	1,614	1,588	724	2,437
Norway	83	-17	181	315	12	614	397	-6	795
Poland	2,072	372	3,761	12,426	6,921	17,878	14,498	7,293	21,639
Portugal	668	324	1,009	2,250	1,285	3,172	2,917	1,610	4,181
Romania	3,516	1,678	5,340	11,659	7,574	14,463	15,175	9,252	19,804
Slovakia	378	-23	775	2,113	954	3,121	2,491	931	3,896
Slovenia	165	88	242	780	505	1,037	945	593	1,279
Spain	1,611	883	2,336	5,974	3,453	8,474	7,585	4,336	10,811
Sweden	214	53	372	579	240	910	794	293	1,282
Switzerland	251	147	352	719	416	1,018	970	563	1,370
United Kingdom	2,607	908	4,274	5,482	2,235	8,656	8,089	3,143	12,930
European Union	25,284	10,390	39,973	94,451	55,376	130,712	119,736	65,766	170,685
For comparison									
Russia	44,976	21,315	68,496	232,936	148,036	277,250	277,912	169,350	345,746
Regions									
Central-West and Western Europe	11,419	5,570	17,164	36,561	22,087	50,797	47,980	27,658	67,960
Central-East and Eastern Europe	9,197	3,181	15,148	43,186	26,168	57,777	52,383	29,349	72,924
Nordic Countries	914	257	1,562	3,173	1,343	4,978	4,088	1,600	6,539
Southern Europe	4,091	1,509	6,642	12,572	6,197	18,815	16,663	7,707	25,457

Web Appendix 5: Standardized Mortality per 100,000

These tables outline the standardized mortality per 100,000, by sex, for people aged 15–64 living in European countries in 2004.





Web Appendix 6: Alcohol-Attributable PYLL

The table below outlines the estimates and confidence intervals of the proportion of alcohol-attributable PYLL to all PYLL, for people aged 15–64 living in European countries in 2004.

Countries	Women			Men			Total		
	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate
Austria	8.2%	4.6%	11.8%	17.4%	10.9%	23.9%	14.4%	8.9%	19.9%
Belgium	7.9%	4.1%	11.7%	12.8%	7.3%	18.2%	11.1%	6.2%	15.9%
Bulgaria	3.7%	-0.9%	8.3%	9.8%	4.4%	15.2%	7.9%	2.7%	13.0%
Cyprus	2.6%	-0.8%	6.0%	3.1%	-0.7%	6.7%	2.8%	-0.8%	6.4%
Czech Republic	8.4%	3.5%	13.3%	21.0%	12.5%	27.7%	17.0%	9.6%	23.0%
Denmark	8.2%	4.6%	11.8%	16.8%	11.0%	22.6%	13.5%	8.6%	18.4%
Estonia	13.2%	8.0%	18.4%	33.5%	22.5%	41.9%	28.0%	18.5%	35.5%
Finland	8.3%	2.2%	14.3%	18.4%	7.8%	29.1%	15.2%	6.0%	24.4%
France	8.7%	5.6%	11.7%	17.0%	11.4%	22.5%	14.4%	9.7%	19.2%
Germany	7.9%	4.2%	11.5%	14.9%	9.7%	20.1%	12.5%	7.8%	17.1%
Greece	4.9%	0.8%	9.0%	5.4%	0.9%	9.9%	5.2%	0.8%	9.6%
Hungary	10.5%	5.5%	15.4%	22.6%	15.9%	29.3%	18.9%	12.7%	25.0%
Iceland	2.6%	-1.5%	6.5%	4.6%	-2.1%	11.3%	3.7%	-2.0%	9.4%
Ireland	7.0%	3.3%	10.8%	12.0%	5.4%	18.6%	10.2%	4.6%	15.7%
Italy	5.0%	1.3%	8.5%	7.2%	3.1%	11.1%	6.4%	2.5%	10.3%
Latvia	12.8%	5.9%	19.6%	34.0%	23.2%	37.1%	27.8%	18.1%	31.9%
Lithuania	10.1%	5.3%	14.7%	32.8%	21.9%	42.7%	26.9%	17.6%	35.5%
Luxembourg	7.9%	2.4%	13.3%	16.1%	8.1%	24.0%	13.3%	6.2%	20.4%
Malta	2.4%	-0.8%	5.5%	3.7%	0.1%	7.2%	3.2%	-0.3%	6.6%
Netherlands	5.1%	2.5%	7.8%	7.5%	3.6%	11.3%	6.5%	3.1%	9.8%
Norway	3.5%	0.0%	7.0%	8.1%	1.3%	14.8%	6.4%	0.8%	11.9%
Poland	6.9%	1.9%	11.9%	18.9%	10.9%	26.7%	15.4%	8.3%	22.4%
Portugal	9.9%	5.1%	14.7%	16.2%	9.1%	22.9%	14.3%	8.0%	20.5%
Romania	14.4%	7.3%	21.5%	25.4%	16.5%	31.4%	22.0%	13.6%	28.3%
Slovakia	9.0%	0.9%	16.9%	21.7%	10.6%	31.3%	18.2%	7.9%	27.3%
Slovenia	11.6%	6.5%	16.7%	24.7%	16.1%	32.8%	20.8%	13.2%	28.0%
Spain	8.5%	4.7%	12.2%	14.1%	7.9%	20.3%	12.4%	7.0%	17.8%
Sweden	4.3%	1.3%	7.3%	8.4%	4.0%	12.8%	6.8%	2.9%	10.7%
Switzerland	6.7%	4.1%	9.3%	12.3%	7.0%	17.5%	10.2%	5.9%	14.4%
United Kingdom	7.1%	3.1%	11.1%	10.5%	5.0%	15.9%	9.2%	4.3%	14.0%
European Union	8.0%	3.7%	12.2%	16.0%	9.6%	22.0%	13.4%	7.7%	18.8%
For comparison									
Russia	15.5%	7.8%	23.2%	33.9%	21.9%	40.1%	29.3%	18.4%	35.8%
Regions									
Central-West and Western Europe	7.7%	4.1%	11.1%	14.0%	8.6%	19.3%	11.8%	7.1%	16.5%
Central-East and Eastern Europe	9.6%	3.9%	15.2%	21.8%	13.5%	28.9%	18.1%	10.6%	24.7%
Nordic Countries	6.1%	2.1%	10.1%	13.3%	6.3%	20.2%	10.7%	4.8%	16.5%
Southern Europe	6.6%	2.7%	10.4%	10.5%	5.3%	15.7%	9.3%	4.5%	14.0%

Web Appendix 7: Alcohol-Attributable YLD

The table below outlines the estimates and confidence intervals of the proportion of alcohol-attributable YLD to all YLD, for people aged 15–64 living in European countries in 2004.

Countries	Women			Men			Total		
	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate
Austria	2.2%	1.3%	3.1%	14.2%	12.8%	15.6%	7.6%	6.4%	8.7%
Belgium	1.8%	0.8%	2.7%	7.6%	6.2%	9.1%	4.3%	3.0%	5.5%
Bulgaria	0.4%	-0.9%	1.6%	10.3%	7.9%	12.8%	5.3%	3.4%	7.1%
Cyprus	-2.8%	-4.2%	-1.4%	7.1%	5.6%	8.5%	1.9%	0.4%	3.3%
Czech Republic	1.3%	-0.2%	2.7%	15.1%	12.6%	17.5%	7.9%	5.9%	9.8%
Denmark	2.0%	1.0%	2.9%	14.0%	12.5%	15.4%	7.2%	5.9%	8.4%
Estonia	4.1%	3.0%	5.2%	26.8%	24.6%	28.9%	15.9%	14.2%	17.5%
Finland	2.6%	1.1%	4.0%	19.1%	16.7%	21.4%	10.4%	8.5%	12.3%
France	2.8%	1.9%	3.6%	15.5%	14.1%	16.9%	8.5%	7.4%	9.6%
Germany	1.9%	0.8%	2.9%	16.0%	14.5%	17.4%	8.3%	7.0%	9.5%
Greece	1.6%	0.2%	2.9%	12.2%	10.2%	14.2%	6.6%	4.8%	8.2%
Hungary	4.9%	3.6%	6.0%	33.5%	31.7%	35.2%	19.3%	17.7%	20.8%
Iceland	1.5%	0.7%	2.3%	10.0%	8.4%	11.5%	5.2%	3.9%	6.4%
Ireland	2.8%	1.9%	3.6%	14.8%	13.5%	16.1%	8.3%	7.1%	9.3%
Italy	0.4%	-0.6%	1.4%	2.4%	0.6%	4.2%	1.3%	-0.1%	2.7%
Latvia	4.4%	2.9%	5.9%	28.0%	25.5%	30.2%	16.6%	14.6%	18.5%
Lithuania	4.9%	3.8%	5.8%	30.4%	28.2%	32.5%	18.4%	16.7%	20.0%
Luxembourg	2.5%	1.2%	3.7%	14.7%	12.8%	16.5%	8.0%	6.5%	9.6%
Malta	-0.2%	-1.5%	1.0%	8.2%	6.4%	9.9%	3.5%	1.9%	5.0%
Netherlands	2.0%	1.2%	2.7%	17.7%	16.7%	18.7%	9.1%	8.2%	10.0%
Norway	6.2%	5.2%	7.2%	26.1%	24.7%	27.4%	15.6%	14.4%	16.8%
Poland	1.9%	0.7%	3.0%	13.6%	11.0%	16.3%	7.7%	5.7%	9.6%
Portugal	3.4%	2.2%	4.6%	13.9%	11.8%	16.0%	8.5%	6.8%	10.2%
Romania	3.5%	1.8%	5.1%	17.7%	14.4%	20.9%	10.6%	8.0%	13.0%
Slovakia	1.6%	-0.1%	3.4%	22.8%	19.9%	25.8%	12.8%	10.4%	15.2%
Slovenia	2.4%	1.2%	3.6%	13.0%	10.6%	15.4%	7.3%	5.5%	9.1%
Spain	1.0%	0.1%	1.9%	5.4%	3.6%	7.3%	3.1%	1.7%	4.5%
Sweden	5.7%	4.9%	6.5%	21.2%	20.2%	22.3%	12.5%	11.6%	13.5%
Switzerland	2.2%	1.5%	2.9%	13.7%	12.5%	14.8%	7.3%	6.3%	8.3%
United Kingdom	3.5%	2.4%	4.5%	19.0%	17.7%	20.2%	10.7%	9.4%	11.9%
European Union	2.2%	1.1%	3.3%	14.5%	12.7%	16.2%	7.9%	6.5%	9.4%
For comparison									
Russia	6.5%	4.6%	8.3%	30.0%	27.1%	32.8%	19.6%	17.1%	22.0%
Regions									
Central-West and Western Europe	2.6%	1.6%	3.5%	16.3%	14.9%	17.6%	8.8%	7.6%	9.9%
Central-East and Eastern Europe	2.5%	1.2%	3.9%	18.1%	15.4%	20.7%	10.3%	8.2%	12.3%
Nordic Countries	4.2%	3.1%	5.2%	20.0%	18.5%	21.5%	11.3%	10.0%	12.6%
Southern Europe	1.0%	-0.1%	2.0%	5.8%	3.9%	7.6%	3.1%	1.7%	4.6%

Web Appendix 8: Alcohol-Attributable DALYs

The table below outlines the estimates and confidence intervals of the proportion of alcohol-attributable DALYs to all DALYs, for people aged 15–64 living in European countries in 2004.

	Women			Men			Total		
Countries	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate	Point estimate	Lower estimate	Upper estimate
Austria	3.8%	2.2%	5.3%	15.6%	11.9%	19.3%	10.1%	7.3%	12.8%
Belgium	3.5%	1.7%	5.2%	10.1%	6.7%	13.4%	6.9%	4.2%	9.5%
Bulgaria	1.6%	-0.9%	4.0%	10.1%	5.9%	14.1%	6.6%	3.0%	10.0%
Cyprus	-1.6%	-3.5%	0.2%	5.6%	3.3%	7.8%	2.2%	0.0%	4.2%
Czech Republic	3.6%	1.0%	6.1%	18.1%	12.6%	22.8%	11.9%	7.5%	15.7%
Denmark	3.8%	2.1%	5.5%	15.3%	11.9%	18.6%	9.6%	6.9%	12.2%
Estonia	7.7%	5.0%	10.4%	31.0%	23.3%	37.1%	22.6%	16.6%	27.5%
Finland	4.2%	1.4%	6.9%	18.8%	12.6%	24.9%	12.3%	7.5%	17.1%
France	4.3%	2.9%	5.7%	16.2%	12.9%	19.6%	10.8%	8.3%	13.3%
Germany	3.6%	1.8%	5.3%	15.5%	12.4%	18.6%	9.9%	7.3%	12.4%
Greece	2.5%	0.4%	4.5%	9.1%	5.9%	12.3%	6.1%	3.3%	8.7%
Hungary	7.1%	4.4%	9.7%	27.2%	22.6%	31.8%	19.1%	15.2%	22.9%
Iceland	1.8%	0.1%	3.4%	7.9%	4.4%	11.4%	4.7%	2.1%	7.3%
Ireland	4.0%	2.2%	5.6%	13.6%	10.0%	17.2%	9.0%	6.2%	11.7%
Italy	1.6%	-0.1%	3.3%	4.6%	1.7%	7.3%	3.1%	0.8%	5.4%
Latvia	7.9%	4.1%	11.6%	31.7%	24.0%	34.6%	22.8%	16.5%	26.0%
Lithuania	6.9%	4.4%	9.2%	31.9%	24.3%	38.9%	23.0%	17.2%	28.5%
Luxembourg	3.9%	1.5%	6.3%	15.3%	10.7%	19.8%	10.0%	6.4%	13.5%
Malta	0.5%	-1.3%	2.2%	6.4%	3.8%	8.8%	3.4%	1.2%	5.5%
Netherlands	2.9%	1.6%	4.2%	13.7%	11.6%	15.8%	8.2%	6.4%	9.9%
Norway	5.5%	3.8%	7.1%	19.2%	15.7%	22.6%	12.5%	9.8%	15.1%
Poland	3.5%	1.1%	6.0%	16.5%	10.9%	22.0%	11.3%	6.9%	15.6%
Portugal	5.3%	3.0%	7.6%	15.0%	10.5%	19.4%	10.9%	7.3%	14.5%
Romania	7.6%	3.9%	11.3%	22.1%	15.6%	26.9%	16.3%	10.8%	20.7%
Slovakia	4.0%	0.2%	7.7%	22.3%	15.1%	28.6%	15.2%	9.2%	20.6%
Slovenia	5.1%	2.7%	7.4%	19.0%	13.4%	24.3%	13.1%	8.8%	17.1%
Spain	2.9%	1.2%	4.5%	9.4%	5.6%	13.2%	6.6%	3.7%	9.5%
Sweden	5.3%	4.0%	6.7%	16.4%	14.0%	18.7%	10.7%	8.8%	12.6%
Switzerland	3.3%	2.1%	4.5%	13.1%	10.3%	15.9%	8.3%	6.2%	10.3%
United Kingdom	4.5%	2.6%	6.4%	15.6%	12.6%	18.5%	10.1%	7.6%	12.6%
European Union	3.9%	1.9%	5.9%	15.2%	11.2%	19.0%	10.1%	6.9%	13.1%
For comparison									
Russia	11.0%	6.2%	15.8%	32.8%	23.4%	37.9%	25.9%	17.9%	30.9%
Regions									
Central-West and Western Europe	4.0%	2.3%	5.6%	15.3%	12.2%	18.4%	9.9%	7.4%	12.3%
Central-East and Eastern Europe	5.0%	2.1%	7.9%	20.2%	14.3%	25.3%	14.1%	9.4%	18.3%
Nordic Countries	4.7%	2.9%	6.5%	17.2%	13.4%	21.0%	11.1%	8.2%	14.0%
Southern Europe	2.4%	0.6%	4.2%	7.9%	4.5%	11.3%	5.4%	2.7%	8.1%

Web Appendix 9: Alcohol-Attributable Deaths, by Region

The tables below outline alcohol-attributable deaths for the four European regions, broken down by sex and by broad disease categories, for people aged 15–64 living in European countries in 2004.

Central-West and Western Europe: alcohol-attributable deaths

Detrimental effects	**Men #s**	**Women #s**	**Men %**	**Women %**
Cancer	8,770	4,616	20.0%	35.2%
CVD (other than IHD)	2,189	542	5.0%	4.1%
Mental and neurological disorders	6,836	1,679	15.6%	12.8%
Liver cirrhosis	12,443	4,905	28.4%	37.4%
Unintentional injury	5,739	530	13.1%	4.0%
Intentional injury	6,935	606	15.8%	4.6%
Other detrimental	964	238	2.2%	1.8%
Total detrimental	43,875	13,116	100.0%	100.0%
Beneficial effects				
IHD	(7,106)	(1,097)	97.2%	64.6%
Other beneficial	(207)	(600)	2.8%	35.4%
Total beneficial	(7,313)	(1,698)	100.0%	100.0%

Central-East and Eastern Europe: alcohol-attributable deaths

Detrimental effects	**Men #s**	**Women #s**	**Men %**	**Women %**
Cancer	5,124	2,010	10.7%	20.3%
CVD (other than IHD)	4,403	2,023	9.2%	20.5%
Mental and neurological disorders	2,994	448	6.3%	4.5%
Liver cirrhosis	11,127	3,941	23.3%	39.8%
Unintentional injury	14,685	864	30.8%	8.7%
Intentional injury	7,435	320	15.6%	3.2%
Other detrimental	1,974	285	4.1%	2.9%
Total detrimental	47,741	9,891	100.0%	100.0%
Beneficial effects				
IHD	(4,524)	(427)	99.3%	61.5%
Other beneficial	(32)	(268)	0.7%	38.5%
Total beneficial	(4,555)	(695)	100.0%	100.0%

Nordic countries: alcohol-attributable deaths

Detrimental effects	Men #s	Women #s	Men %	Women %
Cancer	407	357	10.4%	33.7%
CVD (other than IHD)	204	28	5.2%	2.6%
Mental and neurological disorders	792	175	20.3%	16.5%
Liver cirrhosis	985	355	25.2%	33.4%
Unintentional injury	857	74	21.9%	7.0%
Intentional injury	599	56	15.3%	5.3%
Other detrimental	63	17	1.6%	1.6%
Total detrimental	3,908	1,062	100.0%	100.0%
Beneficial effects				
IHD	(709)	(85)	96.5%	58.0%
Other beneficial	(26)	(62)	3.5%	42.0%
Total beneficial	(734)	(147)	100.0%	100.0%

Southern Europe: alcohol-attributable deaths

Detrimental effects	Men #s	Women #s	Men %	Women %
Cancer	3,284	1,842	21.5%	40.5%
CVD (other than IHD)	1,181	538	7.7%	11.8%
Mental and neurological disorders	463	86	3.0%	1.9%
Liver cirrhosis	4,165	1,411	27.3%	31.0%
Unintentional injury	3,874	349	25.4%	7.7%
Intentional injury	1,837	218	12.0%	4.8%
Other detrimental	475	102	3.1%	2.3%
Total detrimental	15,279	4,547	100.0%	100.0%
Beneficial effects				
IHD	(2,633)	(220)	97.3%	48.2%
Other beneficial	(74)	(237)	2.7%	51.8%
Total beneficial	(2,707)	(456)	100.0%	100.0%

Web Appendix 10: Alcohol-Attributable DALYs

The tables below outline the alcohol-attributable burden of disease in DALYs for the four European regions, broken down by sex and by broad disease categories, for people aged 15–64 in 2004.

Central-West and Western Europe: alcohol-attributable DALYs

Detrimental effects	**Men #s**	**Women #s**	**Men %**	**Women %**
Cancer	126,235	81,615	7.4%	18.4%
CVD (other than IHD)	37,134	-	2.2%	0.0%
Mental and neurological disorders	991,447	227,115	58.4%	51.2%
Liver cirrhosis	222,449	100,779	13.1%	22.7%
Unintentional injury	150,413	15,590	8.9%	3.5%
Intentional injury	147,055	12,456	8.7%	2.8%
Other detrimental	24,208	6,366	1.4%	1.4%
Total detrimental	1,698,940	443,920	100.0%	100.0%
Beneficial effects				
IHD	(132,108)	(45,336)	94.3%	45.8%
Other beneficial	(8,056)	(50,157)	5.7%	50.7%
CVD other than IHD	-	(3,530)	0.0%	3.6%
Total beneficial	(140,164)	(99,022)	100.0%	100.0%

Central-East and Eastern Europe: alcohol-attributable DALYs

Detrimental effects	**Men #s**	**Women #s**	**Men %**	**Women %**
Cancer	75,905	33,349	5.4%	12.3%
CVD (other than IHD)	68,122	24,871	4.8%	9.2%
Mental and neurological disorders	497,910	93,774	35.3%	34.7%
Liver cirrhosis	204,754	79,656	14.5%	29.5%
Unintentional injury	365,247	23,812	25.9%	8.8%
Intentional injury	153,543	6,747	10.9%	2.5%
Other detrimental	45,330	8,117	3.2%	3.0%
Total detrimental	1,410,811	270,326	100.0%	100.0%
Beneficial effects				
IHD	(83,826)	(27,714)	98.0%	59.5%
Other beneficial	(1,724)	(18,857)	2.0%	40.5%
Total beneficial	(85,551)	(46,570)	100.0%	100.0%

Nordic countries: alcohol-attributable DALYs

Detrimental effects	Men #s	Women #s	Men %	Women %
Cancer	5,772	6,224	3.2%	12.3%
CVD (other than IHD)	3,324	-	1.8%	0.0%
Mental and neurological disorders	122,365	33,659	66.8%	66.8%
Liver cirrhosis	17,313	7,054	9.5%	14.0%
Unintentional injury	20,021	1,916	10.9%	3.8%
Intentional injury	12,774	1,162	7.0%	2.3%
Other detrimental	1,563	404	0.9%	0.8%
Total detrimental	183,132	50,420	100.0%	100.0%
Beneficial effects				
IHD	(12,773)	(4,188)	93.0%	41.7%
Other beneficial	(954)	(5,023)	7.0%	50.0%
CVD other than IHD	-	(837)	0.0%	8.3%
Total beneficial	(13,727)	(10,048)	100.0%	100.0%

Southern Europe: alcohol-attributable DALYs

Detrimental effects	Men #s	Women #s	Men %	Women %
Cancer	47,163	33,296	10.9%	26.4%
CVD (other than IHD)	20,762	5,067	4.8%	4.0%
Mental and neurological disorders	132,266	42,064	30.7%	33.4%
Liver cirrhosis	72,625	27,270	16.8%	21.7%
Unintentional injury	105,983	10,322	24.6%	8.2%
Intentional injury	39,203	4,483	9.1%	3.6%
Other detrimental	13,066	3,402	3.0%	2.7%
Total detrimental	431,066	125,903	100.0%	100.0%
Beneficial effects				
IHD	(51,530)	(12,009)	91.6%	35.1%
Other beneficial	(4,731)	(22,217)	8.4%	64.9%
Total beneficial	(56,262)	(34,226)	100.0%	100.0%

Web Appendix 11: Estimating Harm to Others, by Country

Figure 22a: Alcohol-attributable deaths caused by harms to others

The figure below shows the proportion of alcohol-attributable deaths caused by harms to others.

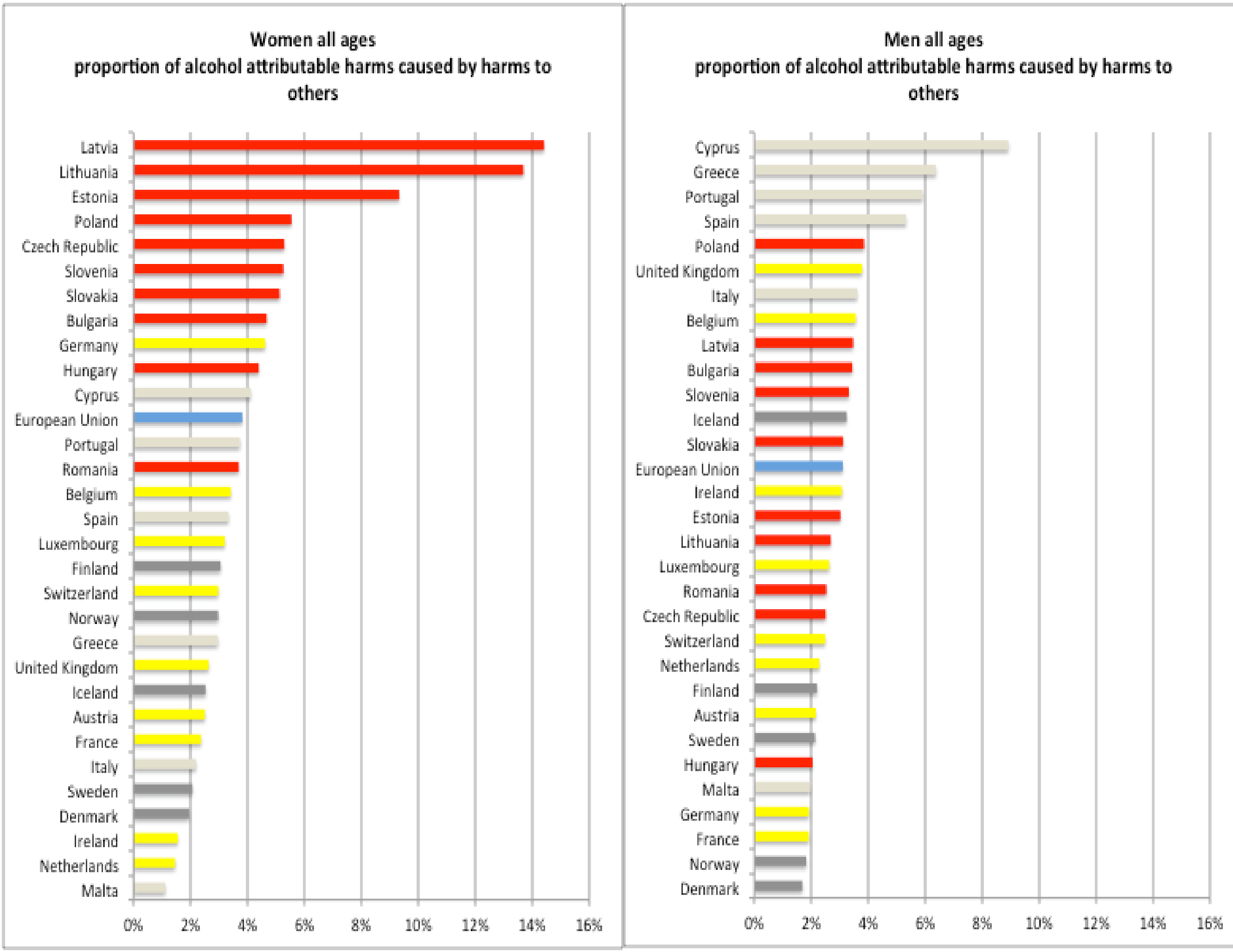
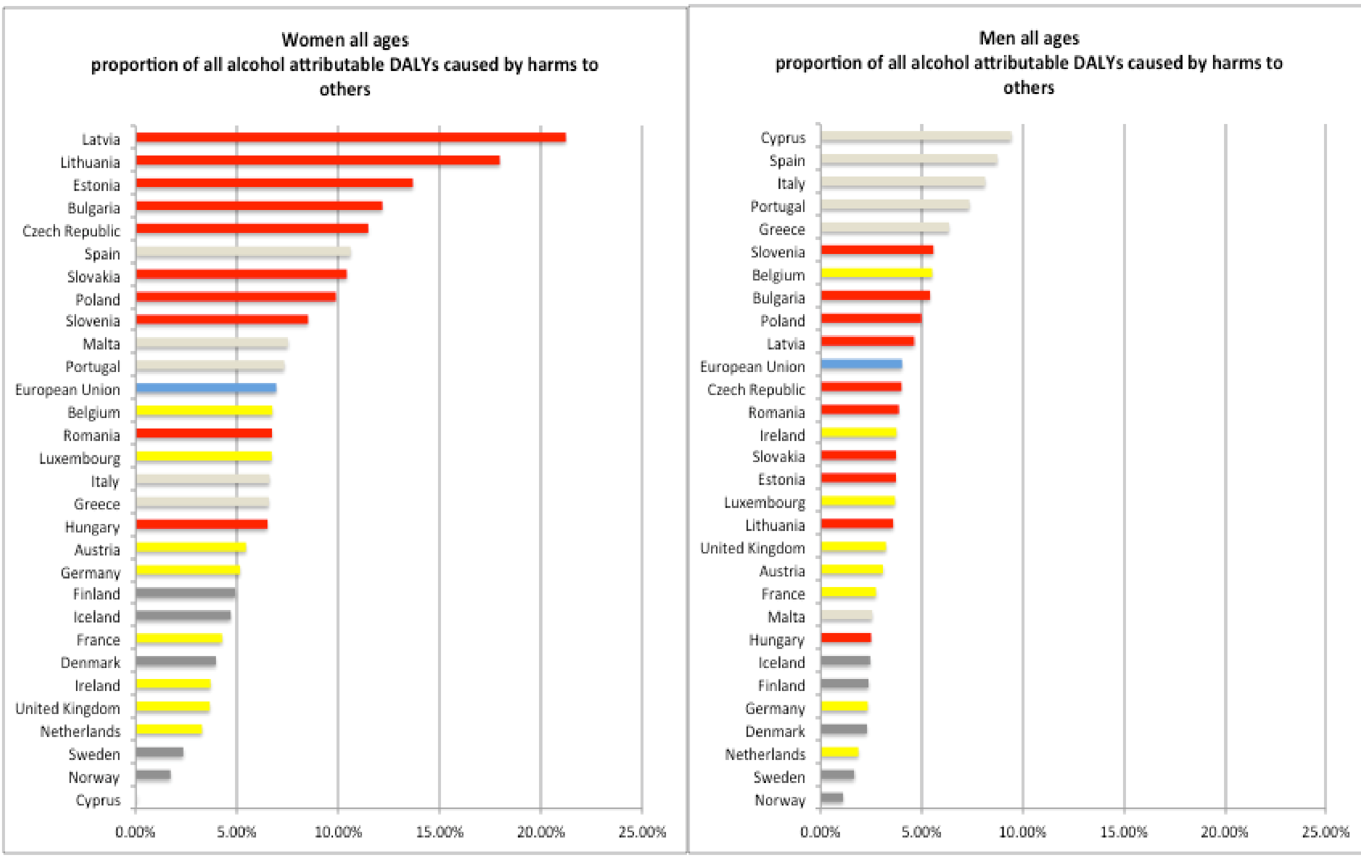


Figure 22b: Alcohol-attributable DALYs caused by harms to others

This figure indicates the proportion of all alcohol-attributable DALYs caused by harms to others.



Web Appendix 12: Prevalence of Alcohol Dependence, by Country

This table outlines the prevalence of adults (15+) with alcohol dependence in European countries. (The figures represent the best estimates for 2005.)

Country	Women	Men	Women affected	Men affected	Year
Austria	2.5	7.5	85,000	255,000	2008
Belgium	1.6	4.7	68,200	190,500	2001
Bulgaria	1.2	6.4	39,500	197,900	2004
Cyprus	1.4	4.7	4,700	14,600	2004
Czech Republic	0.7	4.5	30,000	182,800	2004
Denmark	1.6	4.3	35,200	88,600	2005
Estonia	1.7	9.9	10,500	48,000	2004
Finland	1.5	6.1	32,900	123,800	2000
France	1.3	4.7	314,100	1,073,800	2001-2002
Germany	1.1	4.7	378,900	1,558,200	1997-1999
Greece	1.3	4.2	59,100	188,200	2004
Hungary	3.2	16.5	140,700	632,600	2004
Iceland	0.9	3	970	3,300	2004
Ireland	1.8	5.8	28,300	90,400	2004
Italy	0.4	0.7	104,900	162,600	2001-2003
Latvia	1.3	7.6	13,800	63,800	2004
Lithuania	1.6	8.9	23,800	110,100	2004
Luxembourg	1.2	4.7	2,200	8,200	2000
Malta	0.7	2.5	1,100	4,000	2004
Netherlands	0.4	0.9	28,300	56,400	2007/2009
Norway	2.9	9.4	54,600	164,600	1994-1997
Poland	1.4	7.7	222,300	1,111,900	2004
Portugal	1.4	4.9	64,500	201,500	2004
Romania	0.6	2	54,400	164,700	2007
Slovakia	1.1	10.2	21,700	192,800	2000/2001
Slovenia	2	10.5	14,500	75,500	1999
Spain	0.2	1.2	31,200	186,000	2000/2001
Sweden	2.8	6.7	101,000	236,700	1998-2003
Switzerland	1.4	7.2	42,300	206,800	2007
UK	3.2	8.7	796,400	1,994,700	2007
EU	1.3	4.8	2,707,200	9,213,300	
For comparison					
Russia	3.3	16.5	2,129,200	8,701,200	2004

Web Appendix 13: Prevalence of Alcohol Dependence, by Region

This table outlines the prevalence of alcohol dependence in women and men, aged 18–64, and 15+, in the different regions of Europe (all figures for the year 2005).

Region	AD prevalence 18-64 women in %	AD prevalence 18-64 men in %	Women affected	Men affected
Central-West and Western Europe	1.94	6.18	1,519,400	4,915,600
Central-East and Eastern Europe	1.49	7.84	510,700	2,635,700
Nordic Countries	2.70	7.43	205,810	581,500
Southern Europe	0.59	1.74	239,410	702,500

Region	AD prevalence 15+ women in %	AD prevalence 15+ men in %	Women affected	Men affected
Central-West and Western Europe	1.69	5.59	1,743,800	5,434,000
Central-East and Eastern Europe	1.33	7.16	571,200	2,780,100
Nordic Countries	2.26	6.52	224,670	617,000
Southern Europe	0.50	1.57	265,500	756,900

Web Appendix 14: Alcohol-Attributable Mortality

This section outlines the estimates and confidence intervals of mortality attributable to alcohol consumption and AD, for people aged 15–64 living in Europe in 2004. The table below outlines the proportions of mortality that are attributable to alcohol, in both sexes, plus the confidence intervals.

European Union	Alcohol-attributable (only detrimental effects)	Alcohol-attributable (net effects)	Due to heavy drinking	Due to alcohol dependence
Men	16.11% (95% CI: 10.62-21.16)	13.89% (95% CI: 8.14-19.22)	11.06% (95% CI: 7.61-14.25)	10.72% (95% CI: 8.08-13.36)
Women	8.54% (95% CI: 4.25-12.77)	7.65% (95% CI: 3.14-12.10)	5.27% (95% CI: 2.81-7.51)	3.69% (95% CI: 2.68-4.69)
Total	13.63% (95% CI: 8.54-18.41)	11.85% (95% CI: 6.51-16.89)	9.16% (95% CI: 6.04-12.05)	8.42% (95% CI: 6.61-10.22)

The confidence interval around the mortality attributable to AD was calculated by merging the variances of the individual parameters, using first-order Taylor series approximations. The basic function for mortality due to alcohol dependence (ADAF) can be written as:

$$ADAF = \frac{0.2(P_1RR_{h1} + P_2RR_{h2}) + 0.8(P_1RR_1 + P_2RR_2) - P_{AD}}{0.2(P_1RR_{h1} + P_2RR_{h2}) + 0.8(P_1RR_1 + P_2RR_2) - P_{AD} + 1}$$

where P_{AD} is the prevalence of alcohol dependence, RR_{h1} and RR_{h2} are the relative risks (taken from Hayes and colleagues[113] for the ages 15–44 and 45–64); RR_1 and RR_2 are adapted from a review of the literature (see relevant article in the text) for the age groups 15–44 and 45–64; and P_1 and P_2 are the prevalence of AD in the age groups 15–44 and 45–64. This equation can be written as:

$$ADAF = \frac{Z}{1 + Z}$$

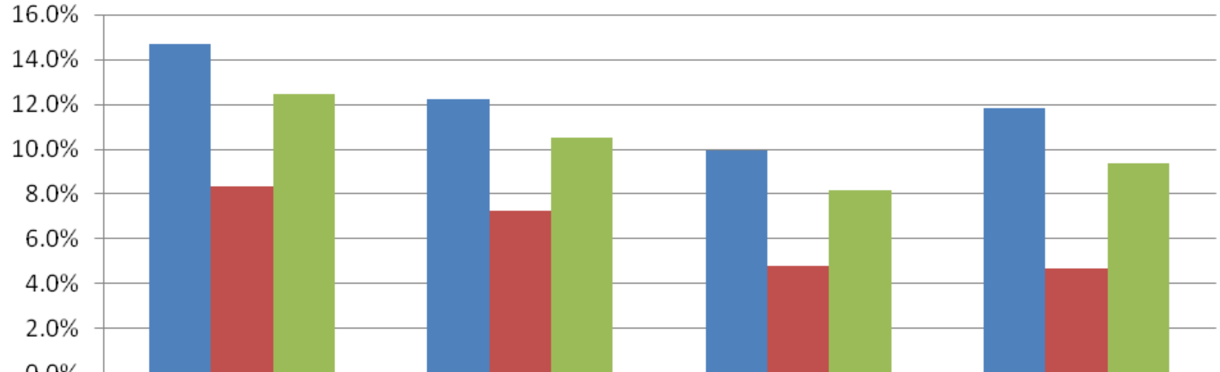
with Z=$0.2(P_1RR_{h1} + P_2RR_{h2}) + 0.8(P_1RR_1 + P_2RR_2) - P_{AD}$. The variance of Z is simply a combination of the individual parameters, and has a closed mathematical expression. Finally, the variance of ADAF (given the variance of Z) can be approximated using a first-order Taylor series expansion:

$$Var[ADAF] \cong \frac{1}{(1 + E[Z])^4} Var[Z]$$

Web Appendix 15: Proportion of Mortality by Region

The tables below outline the proportion of mortality attributable to alcohol consumption and AD, for people aged 15–64, living in different regions of Europe in 2004.

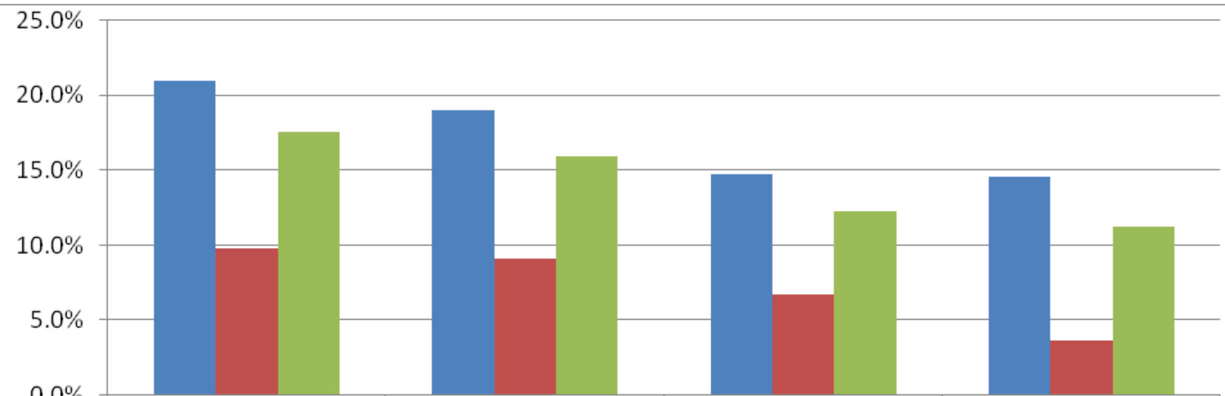
Central-West and Western European Region



	Alcohol-attributable	Alcohol-attributable (net)	Heavy drinking	Alcohol dependence
Men	14.7%	12.2%	10.0%	11.8%
Women	8.3%	7.3%	4.8%	4.7%
Total	12.5%	10.5%	8.2%	9.4%

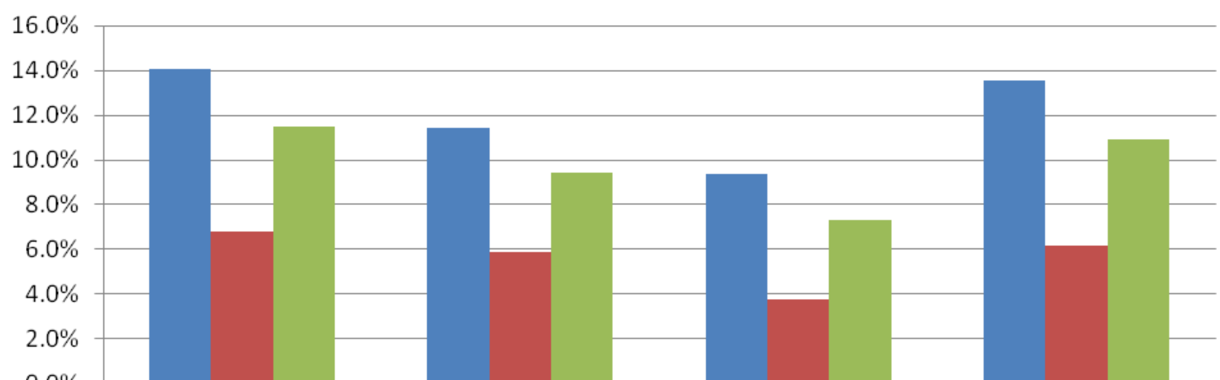
■ Men ■ Women ■ Total

Central-East and Eastern European Region



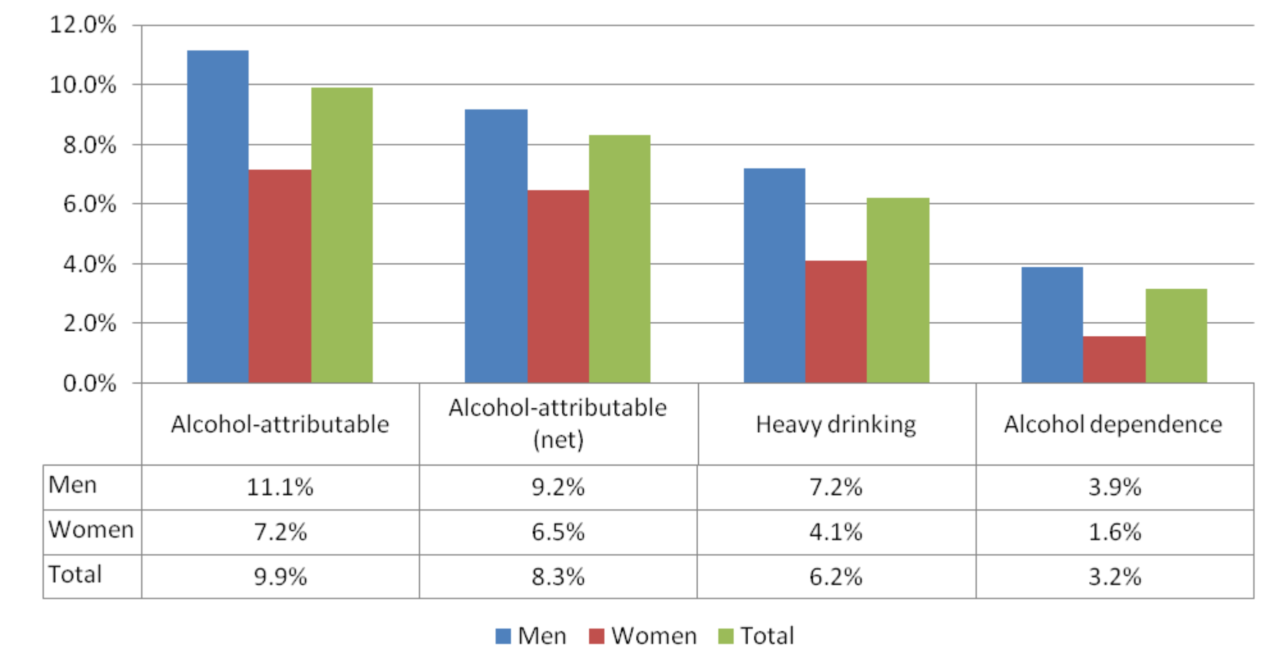
	Alcohol-attributable	Alcohol-attributable (net)	Heavy drinking	Alcohol dependence
Men	21.0%	19.0%	14.7%	14.6%
Women	9.8%	9.13%	6.8%	3.7%
Total	17.6%	16.0%	12.3%	11.2%

Nordic Countries



	Alcohol-attributable	Alcohol-attributable (net)	Heavy drinking	Alcohol dependence
Men	14.1%	11.4%	9.3%	13.6%
Women	6.8%	5.9%	3.8%	6.2%
Total	11.5%	9.4%	7.3%	10.9%

Southern European Region



	Alcohol-attributable	Alcohol-attributable (net)	Heavy drinking	Alcohol dependence
Men	11.1%	9.2%	7.2%	3.9%
Women	7.2%	6.5%	4.1%	1.6%
Total	9.9%	8.3%	6.2%	3.2%

Web Appendix 16: Treatment Access for People with AD

The tables below outline data on treatment access for people with AD, aged 15+, living in European countries in 2004.

	People with AD: women	People with AD: men	Inpatient	Outpatient & other: 1st estimate	Outpatient & other: 2nd estimate	% treated 1st estimate	% treated 2nd estimate	Source, if not WHO database (see note below)
Austria	85,000	255,000	22,400	10,577	41,608	10%	19%	
Belgium	68,200	190,500	11,866	13,065	22,041	10%	13%	
Bulgaria	39,500	197,900	10010	10,112	18,593	8%	12%	
Cyprus	4,700	14,600	68	1,015	126	6%	1%	
Czech Republic	30,000	182,800	14,522	13,158	26,974	13%	20%	
Denmark	35,200	88,600	6,549	6,664	12,165	11%	15%	
Estonia	10,500	48,000	2467	1,726	4,582	7%	12%	
Finland	32,900	123,800	17,327	6,565	32,185	15%	32%	
France	314,100	1,073,800	94,569	75,399	175,660	12%	19%	
Germany	378,900	1,558,200	55,171	118,743	118,743	9%	9%	Reference 203
Greece	59,100	188,200	10427	14,413	19,368	10%	12%	
Hungary	140,700	632,600	12,688	39,308	39,308	7%	7%	http://www.gencat.cat/salut/phepa/units/phepa/pdf/phepa_final_report_annex4_hungary.pdf
Iceland	970	3,300	419	364	778	18%	28%	
Ireland	28,300	90,400	5005	4,973	9,297	8%	12%	
Italy	104,900	162,600	19,613	11,783	11,783	12%	12%	Reference 204
Latvia	13,800	63,800	11,736	2,983	21,799	19%	43%	
Lithuania	23,800	110,100	7,671	4,318	14,249	9%	16%	
Luxembourg	2,200	8,200	1,518	563	2,820	20%	42%	
Malta	1,100	4,000	225	504	418	14%	13%	
Netherlands	28,300	56,400	3,564	20,182	6,620	28%	12%	
Norway	54,600	164,600	2,869	5,952	5,329	4%	4%	
Poland	222,300	1,111,900	15,699	48,402	29,161	5%	3%	
Portugal	64,500	201,500	11216	13,446	20,833	9%	12%	
Romania	54,400	164,700	9238	27,623	17,160	17%	12%	
Slovakia	21,700	192,800	11,901	6,789	22,106	9%	16%	
Slovenia	14,500	75,500	2,527	2,600	4,694	6%	8%	
Spain	31,200	186,000	7,679	56,248	14,264	29%	10%	
Sweden	101,000	236,700	6,176	37,938	37,938	13%	13%	http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/10443/2004-125-3_20041253.pdf
Switzerland	42,300	206,800	13,688	9,901	25,425	9%	16%	
UK	796,400	1,994,700	42,503	74,844	78,949	4%	4%	
EU	2,707,200	9,213,300	414,335	623,944	803,442	9%	10%	

Notes: The green-shaded information is from the European Hospital Morbidity Database. Regarding sources (final column), most data are drawn from the WHO's European Hospital Morbidity Database (HMDB). Retrieved August 2, 2011, from http://data.euro.who.int/hmdb/index.php.

Web Appendix 17: Estimating Intervention Effects

In order to estimate the effect of interventions on mortality, we modelled the alcohol consumption of each country based on individual data representing the average consumption of one person. We then applied formulas indicating shifts in consumption, or reductions of RRs. For each country, we modelled the drinking population using 100,000 data points, or "people," randomly generated using the gamma distribution associated with that country's alcohol consumption (see reference 8). Data were capped at 150 g/day, but sensitivity analyses showed that uncapped data would not lead to different results or conclusions.[8;177] Lifetime abstainers and former drinkers were modelled by applying the proportion of their prevalence to the drinking population as a whole (i.e. to the 100,000 data points).

We assumed that the prevalence of AD among current drinkers in each population was distributed in equal parts, to the right and to the left of a certain threshold value—a value that was fixed at 72 g/day for men and 48 g/day for women. We also assumed that only people with AD above that threshold would potentially undergo the interventions. Among all people with AD above the threshold, recipients for treatment interventions were chosen randomly.

For each intervention, we completed analyses for different scenarios. These assumed that 10%, 20%, 30% or 40% of all people had AD, and thus that 20%, 40%, 60% or 80% of all people with AD were above the threshold value. As presented in the main text, the interventions can be interpreted as downward shifts in the daily alcohol intake (or, in one scenario, as a decrease of the RR associated with alcohol consumption; see main text). Hence, for each intervention, the average alcohol intake of the selected individuals (modelled as data points) was decreased by the amount specified. (Some of these individuals decreased their consumption to the point of abstinence, becoming classified as former drinkers.) We then computed the AAF by applying the RR for various diseases to each data point.

Web Appendix 18: Alcohol-Attributable Deaths Prevented by Treatment

The tables below outline the number and proportion of alcohol-attributable deaths prevented over one year in the European Union by treatment for AD. Figures are first for the whole EU, and then by region; confidence intervals of 95% are given in brackets.

European Union Estimates

EU Men	Deaths prevented			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	2,459 (95% CI:795 – 4,122)	4,980 (95% CI: 1,711 – 8,248)	7,564 (95% CI:2,713 – 12,415)	10,040 (95% CI: 3,740 – 16,341)
MI/CBT	1,020 (95% CI: 627-1,414)	2,051 (95% CI: 1,260-2,841)	3,105 (95% CI: 1,911-4,299)	4,160 (95% CI: 2,561-5,760)
MI/CBT higher effectiveness	1,217 (95% CI: 680-1,754)	2,452 (95% CI: 1,375-3,530)	3,698 (95% CI: 2,082-5,314)	4,985 (95% CI: 2,816-7,154)
BI hospital 1	995 (95% CI: 604-1,385)	2,000 (95% CI: 1,218-2,782)	3,014 (95% CI: 1,836-4,192)	4,051 (95% CI: 2,469-5,633)
BI hospital 2	2,472 (95% CI: 624-4,321)	4,994 (95% CI: 1,490-8,498)	7,563 (95% CI: 2,536-12,590)	10,196 (95% CI: 3,735-16,656)

EU Men	Percent of alcohol-related deaths			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	3.3% (95% CI: 0.7-10.1)	6.6% (95% CI: 1.6-20.3)	10.0% (95% CI: 2.5-30.5)	13.3% (95% CI: 3.4-40.1)
MI/CBT	1.4% (95% CI: 0.6-3.5)	2.7% (95% CI: 1.1-7.0)	4.1% (95% CI: 1.7-10.6)	5.5% (95% CI: 2.3-14.2)
MI/CBT higher effectiveness	1.6% (95% CI: 0.6-4.3)	3.3% (95% CI: 1.3-8.7)	4.9% (95% CI: 1.9-13.1)	6.6% (95% CI: 2.6-17.6)
BI hospital 1	1.3% (95% CI: 0.5-3.4)	2.7% (95% CI: 1.1-6.8)	4.0% (95% CI: 1.7-10.3)	5.4% (95% CI: 2.2-13.8)
BI hospital 2	3.3% (95% CI: 0.6-10.6)	6.6% (95% CI: 1.4-20.9)	10.0% (95% CI: 2.3-30.9)	13.5% (95% CI: 3.4-40.9)

EU Men	Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	0.4% (95% CI: 0.1-0.6)	0.7% (95% CI: 0.3-1.2)	1.1% (95% CI: 0.4-1.8)	1.5% (95% CI: 0.5-2.4)
MI/CBT	0.2% (95% CI: 0.1-0.2)	0.3% (95% CI: 0.2-0.4)	0.5% (95% CI: 0.3-0.6)	0.6% (95% CI: 0.4-0.8)
MI/CBT higher effectiveness	0.2% (95% CI: 0.1-0.3)	0.4% (95% CI: 0.2-0.5)	0.5% (95% CI: 0.3-0.8)	0.7% (95% CI: 0.4-1.1)
BI hospital 1	0.1% (95% CI: 0.1-0.2)	0.3% (95% CI: 0.2-0.4)	0.4% (95% CI: 0.3-0.6)	0.6% (95% CI: 0.4-0.8)
BI hospital 2	0.4% (95% CI: 0.1-0.6)	0.7% (95% CI: 0.2-1.2)	1.1% (95% CI: 0.4-1.9)	1.5% (95% CI: 0.5-2.4)

EU Women	Deaths prevented			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	416 (95% CI:103-729)	838 (95% CI: 214-1,461)	1,269 (95% CI: 336-2,202)	1,704 (95% CI: 462-2,945)
MI/CBT	248 (95% CI: 70-499)	573 (95% CI: 151-996)	857 (95% CI: 230-1,484)	1,148 (95% CI: 320-1,976)
MI/CBT higher effectiveness	324 (95% CI: 63-586)	651 (95% CI: 139-1,162)	985 (95% CI: 226-1,745)	1,315 (95% CI: 311-2,320)
BI hospital 1	266 (95% CI: 75-458)	540 (95% CI: 160-920)	813 (95% CI: 245-1,381)	1,080 (95% CI: 335-1,825)
BI hospital 2	369 (95% CI: 60-678)	739 (95% CI: 132-1,346)	1,111 (95% CI: 210-2,013)	1,492 (95% CI: 299-2,685)

EU Women	Percent of alcohol related deaths			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	2.3% (95% CI: 0.3-10.9)	4.6% (95% CI: 0.7-21.9)	6.9% (95% CI: 1.1-32.9)	9.3% (95% CI: 1.5-44.0)
MI/CBT	1.5% (95% CI: 0.2-7.4)	3.1% (95% CI: 0.5-14.8)	4.7% (95% CI: 0.8-22.0)	6.2% (95% CI: 1.1-29.3)
MI/CBT higher effectiveness	1.8% (95% CI: 0.2-8.7)	3.5% (95% CI: 0.5-17.2)	5.3% (95% CI: 0.8-25.9)	7.1% (95% CI: 1.0-34.4)
BI hospital 1	1.4% (95% CI: 0.2-6.8)	2.9% (95% CI: 0.5-13.7)	4.4% (95% CI: 0.8-20.6)	5.9% (95% CI: 1.1-27.2)
BI hospital 2	2.0% (95% CI: 0.2-10.1)	4.0% (95% CI: 0.4-20.0)	6.0% (95% CI: 0.7-29.9)	8.1% (95% CI: 1.0-39.9)

EU Women	Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift
Pharmacotherapy	0.1% (95% CI: 0.0-0.2)	0.2% (95% CI: 0.1-0.4)	0.4% (95% CI:0.1-0.6)	0.5% (95% CI:0.1-0.8)
MI/CBT	0.1% (95% CI: 0.0-0.1)	0.2% (95% CI: 0.0-0.3)	0.2% (95% CI: 0.1-0.4)	0.3% (95% CI: 0.1-0.6)
MI/CBT higher effectiveness	0.1% (95% CI: 0.0-0.2)	0.2% (95% CI: 0.0-0.3)	0.3% (95% CI: 0.1-0.5)	0.4% (95% CI: 0.1-0.7)
BI hospital 1	0.1% (95% CI: 0.0-0.1)	0.2% (95% CI: 0.0-0.3)	0.2% (95% CI: 0.1-0.4)	0.3% (95% CI: 0.1-0.5)
BI hospital 2	0.1% (95% CI: 0.0-0.2)	0.2% (95% CI: 0.0-0.4)	0.3% (95% CI: 0.1-0.6)	0.4% (95% CI: 0.1-0.8)

The 95% confidence intervals around the above point estimates were estimated using the variance of the alcohol-attributable mortality data. Most of the error stems from the original drinking prevalence distribution and the relative risk functions, which also define the variance of alcohol-attributable mortality. After interventions, this mortality was assumed to consist of two parts: the first “preserved” from the original mortality data, and the second the “changes” made in the population with the interventions. Thus, the first part will have proportionally the same standard error as the overall mortality. As a conservative estimate, the remaining error was estimated to be twice that of the overall mortality. (This calculation method was applied separately to each disease considered.)

The tables below outline the number and proportion of alcohol-attributable deaths prevented over one year in each region of the European Union.

Regional Estimates

Pharmacotherapy Men	Deaths prevented				Percent of alcohol-related deaths				Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	1,199	2,415	3,658	4,748	3.4%	6.9%	10.5%	13.7%	0.4%	0.8%	1.2%	1.6%
Central-East and Eastern Europe	1,027	2,094	3,192	4,334	3.4%	6.9%	10.5%	14.3%	0.5%	0.9%	1.4%	1.9%
Nordic Countries	139	284	431	584	4.5%	9.2%	13.9%	18.9%	0.5%	1.0%	1.6%	2.1%
Southern Europe	157	317	483	648	1.9%	3.8%	5.7%	7.7%	0.1%	0.2%	0.4%	0.5%

Pharmacotherapy Women	Deaths prevented				Percent of alcohol-related deaths				Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	250	496	753	1,008	2.9%	5.7%	8.6%	11.5%	0.2%	0.3%	0.5%	0.6%
Central-East and Eastern Europe	120	245	373	503	1.7%	3.5%	5.4%	7.2%	0.1%	0.2%	0.4%	0.5%
Nordic Countries	32	66	99	133	3.7%	7.4%	11.2%	15.1%	0.0%	0.1%	0.1%	0.2%
Southern Europe	26	56	82	110	1.2%	2.6%	3.9%	5.2%	0.0%	0.1%	0.1%	0.2%

MI/CBT Men	Deaths prevented				Percent of alcohol-related deaths				Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	556	1,115	1,691	2,266	1.6%	3.2%	4.9%	6.5%	0.2%	0.4%	0.6%	0.8%
Central-East and Eastern Europe	362	729	1,103	1,478	1.2%	2.4%	3.6%	4.9%	0.2%	0.3%	0.5%	0.7%
Nordic Countries	65	130	196	263	2.1%	4.2%	6.3%	8.5%	0.2%	0.5%	0.7%	0.9%
Southern Europe	66	134	201	269	0.8%	1.6%	2.4%	3.2%	0.0%	0.1%	0.1%	0.2%

MI/CBT Women	Deaths prevented				Percent of alcohol-related deaths				Proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	173	351	523	705	2.0%	4.0%	6.0%	8.1%	0.1%	0.2%	0.3%	0.4%
Central-East and Eastern Europe	80	160	242	318	1.1%	2.3%	3.5%	4.5%	0.1%	0.2%	0.2%	0.3%
Nordic Countries	21	43	64	86	2.4%	4.8%	7.3%	9.7%	0.1%	0.3%	0.4%	0.6%
Southern Europe	18	36	52	72	0.8%	1.7%	2.4%	3.4%	0.0%	0.1%	0.1%	0.1%

MI/CBT higher effectiveness Men	Deaths prevented				Percent of alcohol-related deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	643	1,294	1,948	2,625	1.9%	3.7%	5.6%	7.6%
Central-East and Eastern Europe	453	915	1,383	1,869	1.5%	3.0%	4.6%	6.2%
Nordic Countries	76	154	233	312	2.5%	5.0%	7.5%	10.1%
Southern Europe	80	160	241	323	1.0%	1.9%	2.9%	3.8%

MI/CBT higher effectiveness Women	Deaths prevented				Percent of alcohol-related deaths				Proportion of total deaths			
	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift
Central-West and Western Europe	176	358	543	721	1.9%	3.9%	5.9%	7.8%	0.1%	0.2%	0.3%	0.5%
Central-East and Eastern Europe	81	158	243	325	1.1%	2.1%	3.3%	4.4%	0.1%	0.2%	0.2%	0.3%
Nordic Countries	23	46	70	93	2.6%	5.1%	7.7%	10.4%	0.1%	0.3%	0.4%	0.6%
Southern Europe	18	36	54	72	0.8%	1.5%	2.3%	3.1%	0.0%	0.1%	0.1%	0.1%

BI Hospital 1 Men	Deaths prevented				percent of alcohol-related deaths				proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	544	1,090	1,650	2,213	1.6%	3.1%	4.7%	6.4%	0.2%	0.4%	0.6%	0.7%
Central-East and Eastern Europe	350	704	1,057	1,429	1.1%	2.3%	3.5%	4.7%	0.2%	0.3%	0.5%	0.6%
Nordic Countries	63	127	192	257	2.0%	4.1%	6.2%	8.3%	0.2%	0.5%	0.7%	0.9%
Southern Europe	65	133	199	263	0.8%	1.6%	2.4%	3.1%	0.0%	0.1%	0.1%	0.2%

BI Hospital 1 Women	Deaths prevented				percent of alcohol-related deaths				proportion of total deaths			
	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift	10% shift	20% shift	30% shift	40% shift
Central-West and Western Europe	162	335	503	670	1.9%	3.8%	5.8%	7.7%	0.1%	0.2%	0.3%	0.4%
Central-East and Eastern Europe	74	145	221	292	1.1%	2.1%	3.2%	4.2%	0.1%	0.1%	0.2%	0.3%
Nordic Countries	21	41	62	83	2.3%	4.6%	7.0%	9.3%	0.1%	0.3%	0.4%	0.5%
Southern Europe	17	34	51	67	0.8%	1.6%	2.4%	3.2%	0.0%	0.1%	0.1%	0.1%

BI Hospital 2 Men	Deaths prevented				percent of alcohol-related deaths				proportion of total deaths			
	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift
Central-West and Western Europe	1,157	2,335	3,532	4,757	3.3%	6.7%	10.2%	13.7%	0.4%	0.8%	1.2%	1.6%
Central-East and Eastern Europe	1,078	2,180	3,311	4,474	3.5%	7.2%	10.9%	14.7%	0.5%	1.0%	1.5%	2.0%
Nordic Countries	137	277	420	565	4.4%	9.0%	13.5%	18.2%	0.5%	1.0%	1.5%	2.0%
Southern Europe	160	323	485	650	1.9%	3.8%	5.8%	7.7%	0.1%	0.2%	0.4%	0.5%

BI Hospital 2 Women	Deaths prevented				percent of alcohol-related deaths				proportion of total deaths			
	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift	10% shift	20% shift	30% shift
Central-West and Western Europe	214	434	650	875	2.5%	5.0%	7.4%	10.0%	0.1%	0.3%	0.4%	0.6%
Central-East and Eastern Europe	113	222	336	450	1.6%	3.2%	4.8%	6.4%	0.1%	0.2%	0.3%	0.4%
Nordic Countries	28	56	84	113	3.1%	6.3%	9.5%	12.7%	0.2%	0.4%	0.5%	0.7%
Southern Europe	24	48	72	97	1.1%	2.3%	3.4%	4.6%	0..0%	0.1%	0.1%	0.2%

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