

# Alcohol in Norway: Use, Consequences and Costs

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November 2013

Oslo Economics Report number 2013-13  
Project number 2013-273-1010

# Alcohol in Norway: Use, Consequences and Costs

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## Sammendrag

De totale alkoholrelaterte kostnadene for det norske samfunnet er over 22 milliarder NOK (2011). I tillegg kommer skadevirkninger som det er vanskelig å prissette. Gjelsvik (2004) anslår at hvert femte barn vokser opp i en familie hvor alkohol er et problem.

Nordmenn bruker i størrelsesorden 30 milliarder NOK på alkohol i året hvorav omtrent 17 milliarder går direkte til staten i form av avgifter.<sup>1</sup> De aller fleste nordmenn konsumerer alkohol på en ikke-skadelig måte, men for noen er alkohol et problem. Disse personenes alkoholkonsum representerer en fare for deres egen og andres helse og velvære, og en stor kostnad for samfunnet.

Norge har i dag et gjennomsnittlig registrert forbruk på 6,6 liter ren alkohol per år for personer over 15 år. Dette er lavt i forhold til andre land i Europa. Drikkemønsteret i Norge er på den annen side relativt sett mer skadelig. Det er antatt at i underkant av 11 prosent av den voksne norske befolkningen har et skadelig forbruk av alkohol, og at 6 prosent er alkoholavhengige (Fekjær, 1996; Rehm, 2012).

Negative konsekvenser av skadelig alkoholforbruk er sykdom og helseplager, problemer i familie og omgangskrets, tapt produksjon på grunn av sykefravær og uførepensjon, og alkoholrelatert kriminalitet. I 2011 var det registrert over 100 000 pasientkontakter innen helsevesenet med alkoholrelatert diagnose. Det alkoholrelaterte sykefraværet representerte et produksjonstap på omtrent 9,2 milliarder NOK i 2011, og hertil kommer omtrent 2,3 milliarder ved langtidsfravær. I tillegg er det antatt at personer med alkoholproblemer er 25 prosent mindre produktive.

**Skadelig høyt forbruk av alkohol er med andre ord et problem med store kostnader, ikke bare for enkeltpersoner, men også for samfunnet som helhet. Rehm (2012) anslår at mindre enn én av ti personer som sliter med alkoholproblemer får behandling. Dette tyder på at det er nødvendig med høyere fokus på alkohol som et problem og bedre behandling for de som har et skadelig høyt forbruk.**

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<sup>1</sup> 11,9 milliarder NOK i alkoholavgifter, 5,5 milliarder NOK i merverdiavgift og 0,4 NOK milliarder i andre avgifter (SIRUS - Statens institutt for rusmiddelforskning).

Om rapportens oppdragsgiver: H. Lundbeck A/S har utviklet et nytt legemiddel (nalmefen) som reduserer inntaket av alkohol for personer med alkoholproblemer og et skadelig høyt forbruk av alkohol. Målet med behandlingen er ikke nødvendigvis avholdenhet, men reduksjon i inntak av alkohol til mindre skadelige nivåer (DRL nivå). Oslo Economics har blitt bedt om å utforme en rapport som viser konsekvenser og kostnader av alkohol, for å kunne plassere nytten av et slikt legemiddel i en rimelig sammenheng.

## Abstract

Alcohol has played an important role in the Norwegian society for a long time. Norwegians spend approximately NOK 30 billion on alcohol every year, of which approximately 17 billion go to the state in form of taxes.<sup>2</sup> The majority of the Norwegian population consume alcohol in a non-harmful way, and for these individuals alcohol is a consumer good that brings utility and joy. Some people on the other hand, consume alcohol in such a way that it can be harmful for both themselves and for the people around them. The consequences of such problematic consumption are costly for the Norwegian society.

H. Lundbeck A/S has developed a new pharmaceutical (nalmefene) that reduces the desire for alcohol through a central nervous mechanism. The product is aimed at individuals with an alcohol consumption that represents a threat to their mental, social or somatic health, but in which total avoidance is not necessarily the goal. Oslo Economics was approached to draft a report on the consequences of alcohol consumption in order to place the value of nalmefene in a reasonable context.

In this report we describe today's consumption of alcoholic beverages in Norway and compare it with previous times and other countries. Subsequently, we discuss various concepts related to use of alcohol such as abuse and addiction, describe why alcohol misuse is costly for individuals and society, and discuss ways to reduce the problems without taking the pleasure away from the majority of the population who consume alcohol in a non-harmful way.

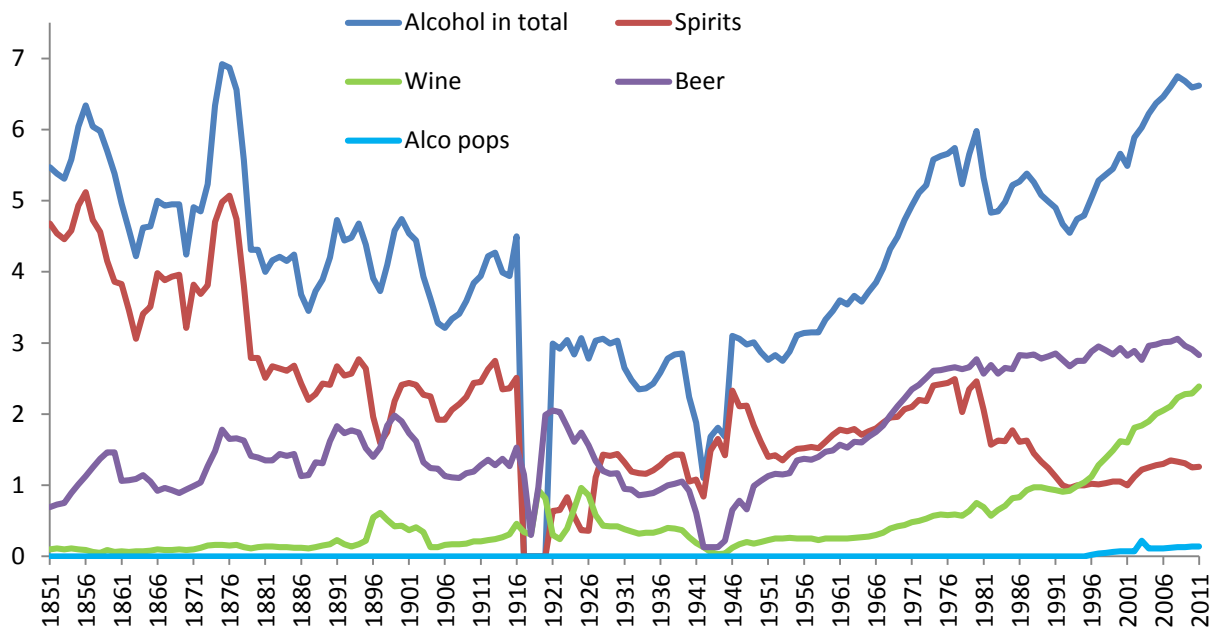
### **The per capita consumption level in Norway is lower than in other countries, but the drinking pattern is more detrimental**

The consumption level in Norway has changed over time, and the development from 1850 to today in the per capita consumption level is U-shaped. Today, most of the consumed alcohol comes from beer drinking.

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<sup>2</sup> NOK 11.9 billion as alcohol taxes, NOK 5.5 billion as VAT and NOK 0.4 billion as other types of taxes (SIRUS - Norwegian Institute for Alcohol and Drug Research).

Figure 1 Alcohol sales of different types of alcohol in Norway, litres of pure alcohol per capita, 1851-2011



Source: Statistics Norway

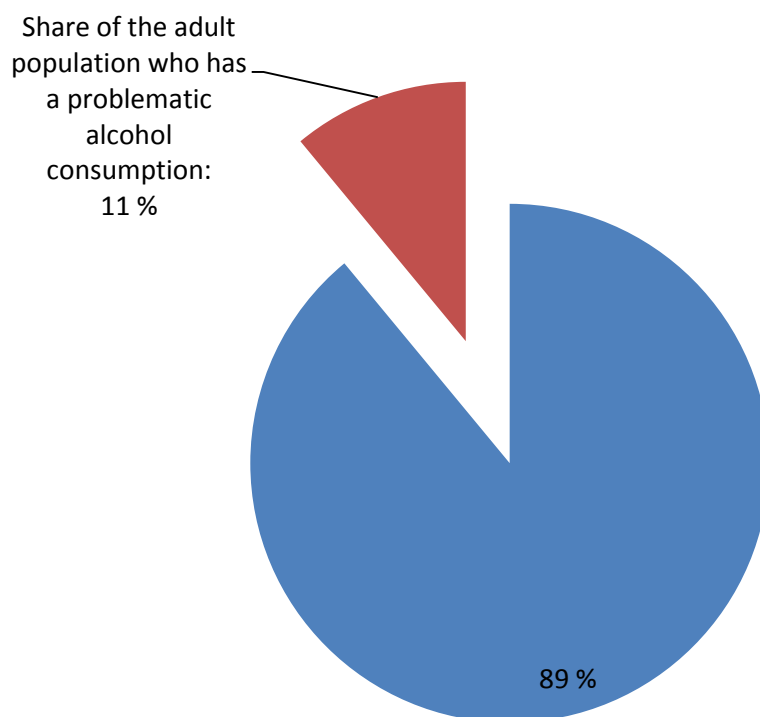
The consumption level and drinking pattern varies in the Norwegian population. The median consumption level is significantly lower than the average. This means that a minority of the population consume a considerable proportion of the total alcohol consumption.

The per capita consumption level in Norway is lower than in most other European countries, but the Norwegian drinking pattern is characterised as more hazardous than the one in many other countries, including Denmark, Bulgaria and France.

### Approximately 11 per cent of the adult Norwegian population consume alcohol in a harmful way

As mentioned, the majority of the Norwegian population consume alcohol in a non-harmful way. On the other hand, some people consume alcohol in such a way that it can be harmful and problematic both for themselves and others. This proportion of the Norwegian population is estimated to be slightly lower than 11 per cent (12-month prevalence).

Figure 2 Proportion of the adult population with a problematic alcohol consumption level/pattern



Source: Oslo Economics/Fekjær (1996)

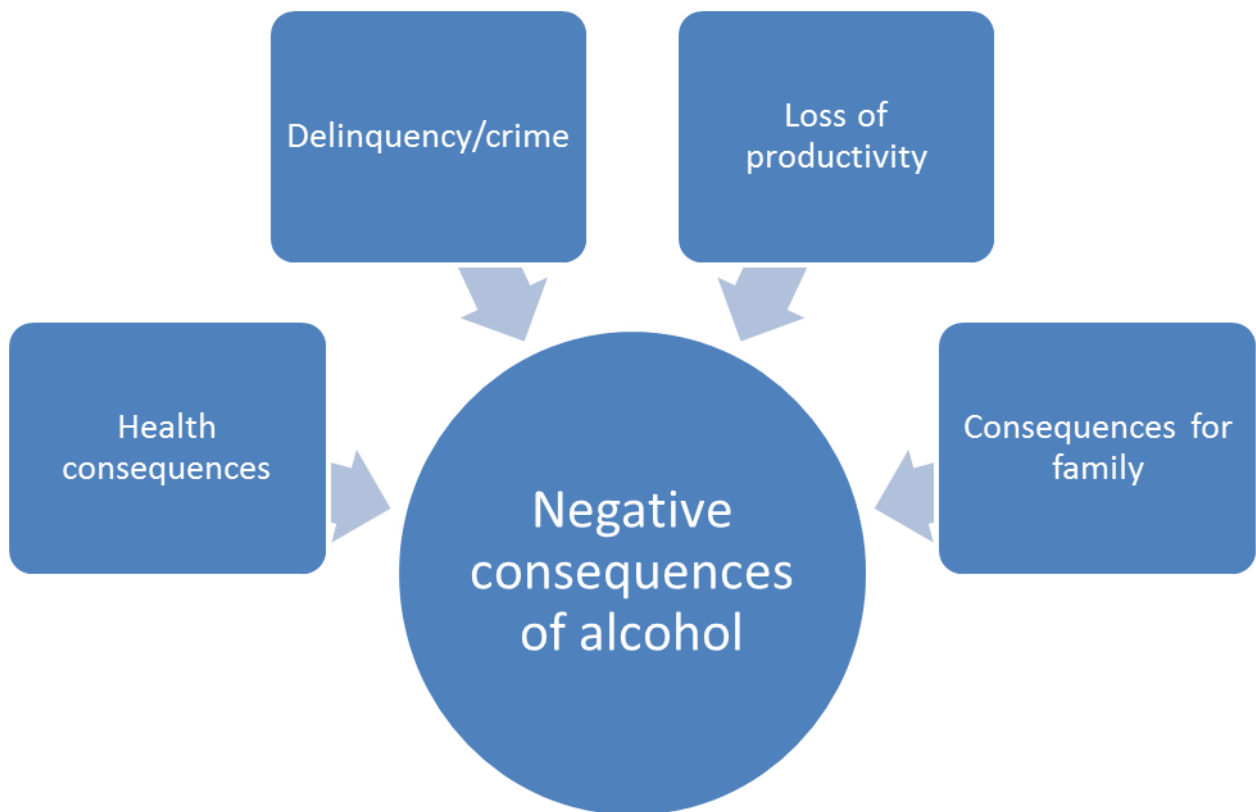
Furthermore, based on the 12-month prevalence proportion, a little less than 6 per cent of the population is estimated to have an alcohol dependency problem (Rehm et al., 2012).

Alcohol dependence, as defined by the diagnostic manual DSM-IV, is characterized by a list of seven criteria, any three of which are sufficient for the diagnosis. The criteria refer to physiological dependence, self-control problems and alcohol-related problems (social, personal, mental or physiological). The phenomenon of addiction is complex, and has been understood within a variety of frameworks. For much of the 20<sup>th</sup> century, the loss of control was highlighted (Levine, 1978; Jellinek, 1960), with the more extreme variants seeing the addict as powerless to resist the urge to drink. More recent work, from researchers such as Gene Heyman, Kent Berridge and George Ainslie, has tried to better understand how self-control problems arise and how they relate to choice. Furthermore, prolonged use of alcohol can give neural damages that heal slowly. Several studies have in addition established that alcoholism is hereditary. These characteristics support the theory of addiction being a disease, and give the individual who is addicted the right to be treated for the condition.



## Alcohol abuse is associated with several problems that are costly for the Norwegian society

Figure 3 Types of negative consequences (“costs”) from alcohol consumption



Source: Oslo Economics

Negative consequences include:

- Increased mortality - 395 deaths in 2011 were by definition caused by alcohol, and an unknown proportion of all deaths caused by for example ischemic heart disease, liver cirrhosis and motor vehicle accidents are alcohol-related.
- Health problems by definition caused by alcohol, the most common diagnoses being mental and behavioural disorders due to use of alcohol - over 100 000 alcohol-attributable patient contacts in somatic and psychiatric care, and in specialised interdisciplinary treatment for substance abuse
- An increased risk of several diseases (such as liver disease, cancer and heart disease)
- A range of health care services for alcohol-related health problems
- Crime - a significant proportion of perpetrators are under the influence of alcohol, and the link may be causal (Grönqvist and Niknami, 2011)

- Loss of productivity because of increased work absenteeism, lost life years and lower quality of work - 14-17 per cent of short-time work absenteeism is assumed to be alcohol-related (Grimsmo and Rossow, 1997), and alcohol abusers are assumed to be 25 per cent less productive than non-abusers (US, 1970)
- Negative consequences on family through unstable and problematic childhood - 1 out of 5 children grow up in a family where alcohol is a problem (Gjelsvik, 2004)
- Increased risk of divorce - in 25-33 per cent of all divorce cases, alcohol is provided as the main or one in many reasons for divorce (Fekjær, 1987)

### **The estimated societal cost of alcohol in 2011 was at least NOK 22 billion**

Table 1 summarises the societal costs of alcohol use and abuse. According to our estimate, the total societal cost amounted to at least NOK 22.4 billion in 2011. Some of these cost elements are however highly uncertain as they are difficult to estimate. The societal cost is likely to be even higher than our estimates.

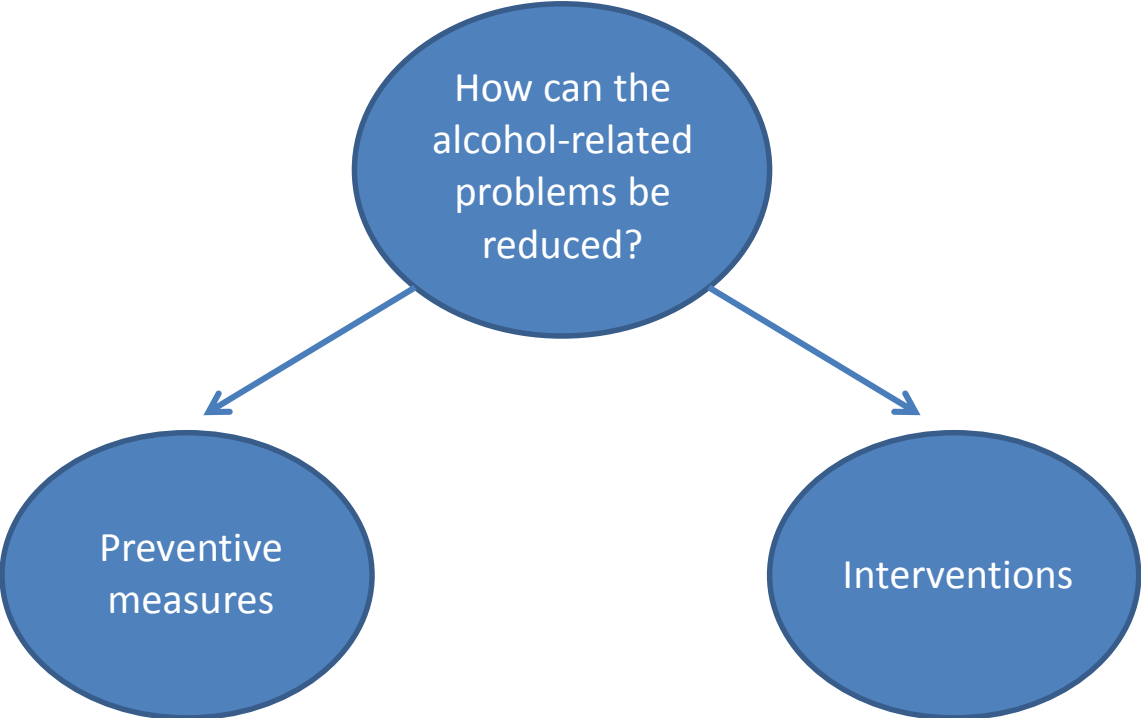
Table 1 Quantifiable effects

Type	Diagnostic criteria	Number of services	Total cost (NOK mill)
<b>Health care costs</b>			
GP services	ICPC: P15, P16	89,489	28.0
Private specialists (somatic)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	352	0.1
Private specialists (psychiatric)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	1,585	0.8
Somatic hospital care	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	43,523	1,756.5
Interdisciplinary services substance abuse	Assumed 32 % of services are alcohol related		1,141.0
Psychiatric care (adults)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	17,043	182.3
Psychiatric care (children and young people)	ICD10: F10	70	0.2
Pharmaceuticals	Pharmaceuticals for alcohol problems	5,084	3.6
Blue Cross services	Assumed that all services are alcohol-related		815.0
<b>Other costs</b>			
Salvation Army services	Assuming that 50 % of services are alcohol-related		133.0
AKAN	Central management: NOK 18 million		118.0
SIRUS	Assuming that 50 % is alcohol-related.		21.5
Delinquency and crime <sup>3</sup>			2,900.0
Traffic accidents (health care, lost life years, etc.)			2,402.4
Fires	Insurance payments (2011), assuming that 25 % is alcohol-related.		1,390.0
Productivity losses caused by short term sick leave			9,200.0
Productivity losses due to long term work absenteeism			2,331.0
<b>Total</b>			<b>22,423.4</b>

Source: Oslo Economics/Gjelsvik (2004)

**Preventive measures and interventions in the health care sector - the largest group with mild dependency problems are often forgotten**

*Figure 4 How can the alcohol-related problems be reduced?*



Source: Oslo Economics

Preventive measures are aimed at the population as a whole and the goal is to reduce the total level of alcohol consumption. The motivation is the assumption that there is a connection between the total amount of consumed alcohol and the level of alcohol-related problems. Preventive measures include price/tax restrictions, age-based, temporal and spatial availability restrictions, and informational campaigns.

Most of the interventions in the health care sector are aimed at the individuals with the acknowledged and most severe problems. The larger group of people with mild dependency problems and a high risk of developing acute problems and chronic harm are often forgotten. Their alcohol consumption is problematic and hazardous in the sense that it creates problems for themselves and those near them, but it is not always obvious to others that they have a drinking problem. Rehm et al. (2012) estimates that less than 1 of 10 individuals with an alcohol dependency problem in Europe receives any treatment for their problem.

# 1 Introduction

In chemistry, alcohol is an organic compound in which the hydroxyl functional group is bound to a carbon atom. Ethanol is likely the most popular, beloved, feared and hated among them. Even though ethanol (in the following called alcohol) is used for a variety of purposes, this report focus on its use as a potentially tasteful beverage, joy, inebriation, but also a source of addiction, abuse and detrimental health effects.

The Chinese produced alcohol 9,000 years ago, and wine was consumed in Greece, Egypt, Persia, India and several other places BC. Among the Aztec, alcohol was only used for religious ceremonies, but used freely among those aged 70 and older. Wine and beer were the early alcoholic beverages while distillation was developed during the medieval period.

During Luther's time, Protestants and Catholics saw alcohol as a gift from God, while many religious groups today have negative attitudes towards it. The variation in alcohol intake across time, place, culture and population is remarkable. An interesting example is Finland which today is a high consumption country with approximately 10 litres of pure alcohol per person per year, but with less than one litre during the nineteenth century.

Alcohol has played an important role in the Norwegian society for a long time. Norwegians spend approximately NOK 30 billion on alcohol every year, of which approximately 17 billion go to the state in form of taxes.<sup>4</sup> The majority of the Norwegian population consume alcohol in a non-harmful way, and for these individuals alcohol is a consumer good that brings utility and joy. Some people on the other hand, consume alcohol in such a way that it can be harmful for both themselves and others. These people abuse, and are in some cases addicted to, alcohol.

H. Lundbeck AS has developed a new pharmaceutical (nalmefene) that reduces the desire for alcohol through a central nervous mechanism. The product is aimed at individuals with an alcohol consumption that represents a threat to their mental, social or somatic health, but in which total avoidance is not necessarily the goal. Oslo Economics was approached to draft a report on the consequences of alcohol consumption in order to place the value of nalmefene in a reasonable context.

In this report we will describe today's consumption of alcohol in Norway and compare it with previous times and other countries. Subsequently, we will discuss various concepts related

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<sup>4</sup> NOK 11.9 billion as alcohol taxes, NOK 5.5 billion as VAT and NOK 0.4 billion as other types of taxes (SIRUS - Norwegian Institute for Alcohol and Drug Research).

to use of alcohol such as abuse and addiction, describe why alcohol misuse is costly for society, estimate the societal cost, and discuss ways to reduce the problems without taking the pleasure away from the majority of the population who consume alcohol in a non-harmful way.

## 2 Alcohol consumption

Alcohol has played an important role in the Norwegian society for a long time. In this chapter we describe how the consumption level and pattern has changed over time, how alcohol is consumed by the Norwegian population today, and how the Norwegian alcohol consumption compares to other countries in Europe.

### 2.1 The Norwegian drinking pattern has changed

#### 2.1.1 Drinking culture

It is common to divide countries into four groups of drinking culture<sup>5</sup>. These groups are abstinence, ritual drinking, internalised drinking and festivity drinking. Muslim-majority countries are often used as an example for abstinence, whilst Orthodox Judaism is an example of ritual drinking. Internalised drinking is characterised by alcohol being an integrated part of everyday life, as with wine in the Mediterranean countries. In these countries, alcohol is not viewed as an intoxicant, but as a natural part of the meal.

The drinking culture in Norway belongs to the fourth group. It is characterised by relatively high consumption of alcohol during holidays, festivities and weekends, and low consumption during the rest of the week.

Over the last couple of decades it has become more common in Norway to consume alcohol on weekdays as well, but the majority of the alcohol is still consumed during weekends and holidays.

Horverak and Bye (2007) sums up the Norwegian drinking culture using six characteristics:

- Norwegian men and women drink relatively large amounts of alcohol when they drink,
- They drink on weekends and during holidays and festivities,
- They usually drink together with other people,
- They have traditionally preferred beer and spirits over wine,
- A meal does not have to be part of the festivity, and
- Women have been, and still are, expected to drink less than men.

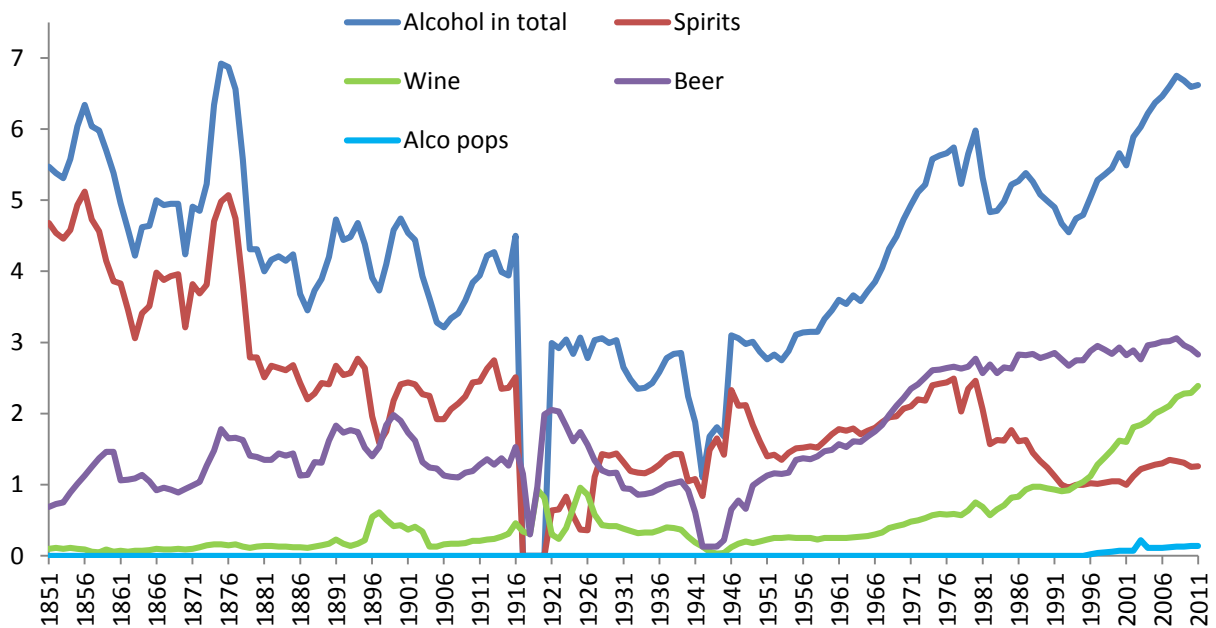
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<sup>5</sup> Horverak and Bye (2007).

## 2.1.2 U-shaped per capita consumption level

Data on alcohol sales, or the registered consumption, for different types of alcohol has been published in Norway every year since 1851. The registered consumption does not include smuggling, legal imports and home-made alcohol. Figure 2-1 shows sales of different types of alcohol per capita in the period 1851-2011.

Figure 2-1 Alcohol sales of different types of alcohol in Norway, litres of pure alcohol per capita, 1851-2011



Source: Statistics Norway

We see that the curve showing alcohol sales per capita is U-shaped. The average Norwegian's consumption of alcohol today is about the same as the level at the end of the 19<sup>th</sup> century. In the beginning of the 20<sup>th</sup> century, interest groups for abstinence were prominent, and alcohol consumption was reduced. It remained relatively low until the 1960s, when it again started to increase. In 2011, the per capita sales figure was 6.6 litres of pure alcohol.

Furthermore, Norwegian's preferences have changed over time. There has been a shift from sales of alcohol from spirits to sales of alcohol from beer and wine.

Up until the mid-1960s, the average Norwegian drank more litres of alcohol from spirits than any other type of alcohol. Beer was the second most important source of alcohol. This changed in the mid-1960s - sale of alcohol from beer rose above the sale of alcohol from spirits. As mentioned, wine has not been as popular as beer and spirits in Norway. This changed in the 1990s when the sale of alcohol from wine overtook sale of alcohol from



spirits. The sale of wine has grown more rapidly than the sale of beer since the beginning of the 1990s, and is now close to catching up with the sale of beer.

Alcohol sales does not tell the full story about how much alcohol Norwegians drink, as all of the consumed alcohol is not purchased and registered within Norway. Some of the alcohol consumed is for example brought into the country illegally, purchased abroad and legally brought into the country, or produced in private homes. In order to give a more correct number for how much alcohol Norwegians consume, it is thus necessary to find an estimate for the total consumption of alcohol.

There are several ways to estimate the total level of alcohol consumption in a country.<sup>6</sup> In an interview you can for example ask questions about how much of different types of alcohol a person usually consumes. Another option is to ask about how much of different types of alcohol a person consumed last time he or she had something to drink. One of the problems with these estimation methods is that people have a tendency to underreport their consumption level.

Nordlund (1992) tries to estimate the extent of underreporting. Using the estimates of total consumption calculated from the reported consumption level of the previous day in 1973, 1979, 1985 and 1991, the article finds that the respondents only reported 42 per cent of their actual consumption level.

This estimate is supported by another study based on self-reported alcohol consumption on Svalbard (Høyer et al., 1995). Svalbard offers a unique setting for validation studies on self-reported consumption, as non-existent illegal production and import makes complete registration of all sources of alcohol possible. Høyer et al. (1995) estimates the coverage of self-reported alcohol consumption compared to sales figures to be 40 per cent.

Table 2-1 shows the alcohol sales and the estimated average yearly consumption of alcohol per adult inhabitant in 1979, 1985, 1994, 1999 and 2004, based on questions about usual consumption level, yesterday's consumption level and yesterday's consumption level corrected for underreporting.

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<sup>6</sup> Horverak and Bye (2007).

*Table 2-1 Yearly alcohol consumption per inhabitant above 15 years of age, litres of pure alcohol*

Method of estimation	Questions about usual consumption level	Questions about consumption level yesterday	Corrected for underreporting	Alcohol turnover
1979	2.28	2.80	6.66	5.65
1985	2.93	2.61	6.21	5.22
1994	4.11	3.04	7.23	4.74
1999	3.37	3.11	7.40	5.45
2004	3.91	3.95	9.41	6.22

Source: Horverak and Bye (2007)

The alcohol turnover, the reported alcohol consumption and thus the estimated consumption corrected for underreporting have gone up in the period between 1979 and 2004.

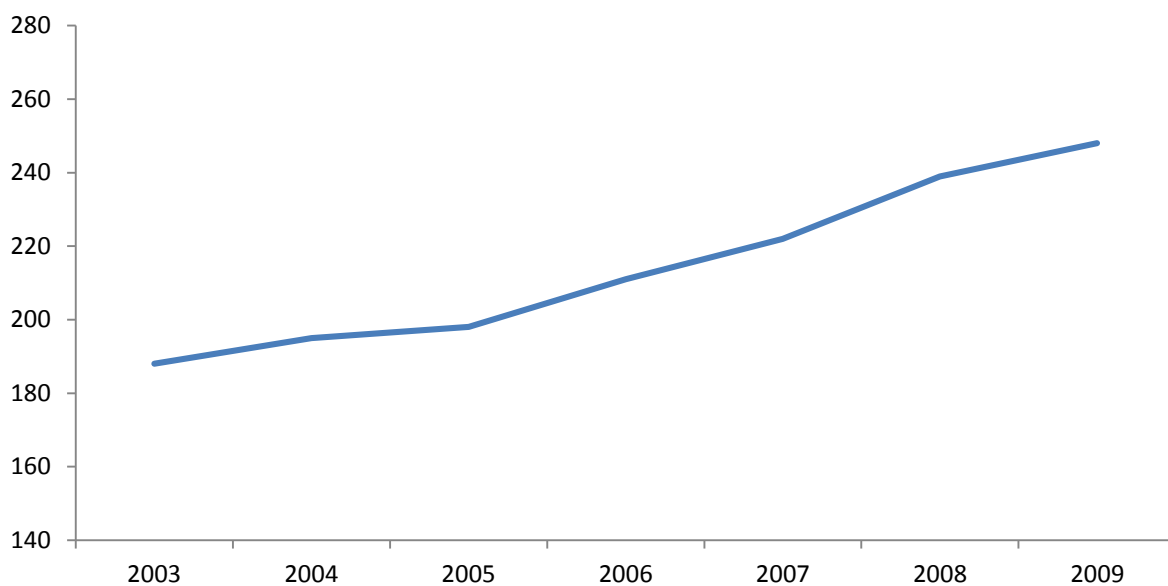
Furthermore, we see that the estimated consumption level based on reported alcohol consumption (column two and three) represent a larger proportion of the alcohol turnover in 2004 than in 1979. This can either be explained by the theory that people report more of their actual consumption level as they get more liberal, or by a shift in consumption from registered alcohol turnover to unregistered alcohol consumption.

### 2.1.3 An increasing number of Vinmonopol

In Norway, only alcoholic beverages with alcohol percentage of 4.75 or below can be sold in regular retail shops and supermarkets. Beverages with higher alcohol content are only sold through “Vinmonopolet”; a state owned monopoly meant to limit accessibility and marketing of stronger alcoholic beverages. The number of retail outlets selling beer is driven by overall developments in the retail grocery market and has shown little relative change over the last ten years, while the number of state monopoly outlets has been increasing. This latter is the result of government alcohol policy.

Figure 2-2 shows the number of state monopoly outlets in the period 2003-2009.

Figure 2-2 Number of state monopoly outlets, 2003-2009



Source: Oslo Economics/RusStat

The number of state monopoly outlets has increased steadily from 188 in 2003 to 248 in 2009.

Figure 2-3 shows the number of retailers of beer in the same period.

Figure 2-3 Number of retailers of beer, 2003-2009



Source: Oslo Economics/RusStat

The relative change in retail outlets selling beer is small, but the number has decreased over the period 2003-2009. In total there were 4,436 retailers of alcohol in Norway in 2009. The

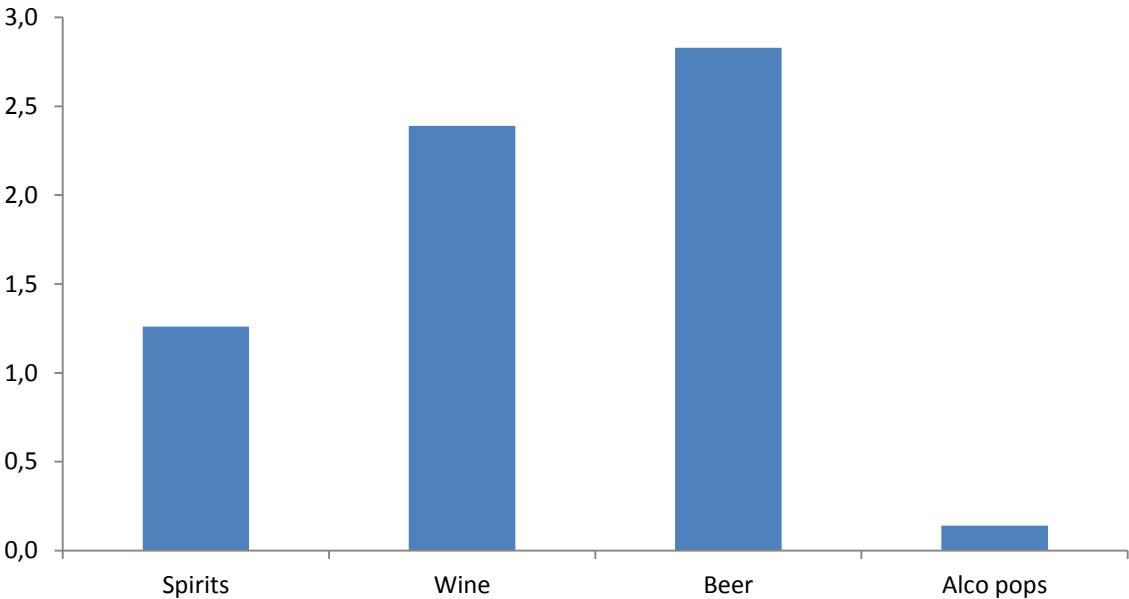
number of state monopoly outlets is significantly lower than the number of retailers of only beer.

## 2.2 Alcohol consumption today

### 2.2.1 Most of the consumed alcohol is from beer

Figure 2-4 shows the alcohol sales in litres of pure alcohol from spirits, wine, beer and alco pops per inhabitant above the age of 15 in 2011.

Figure 2-4 Alcohol sales in litres of pure alcohol per inhabitant above 15 years of age, 2011



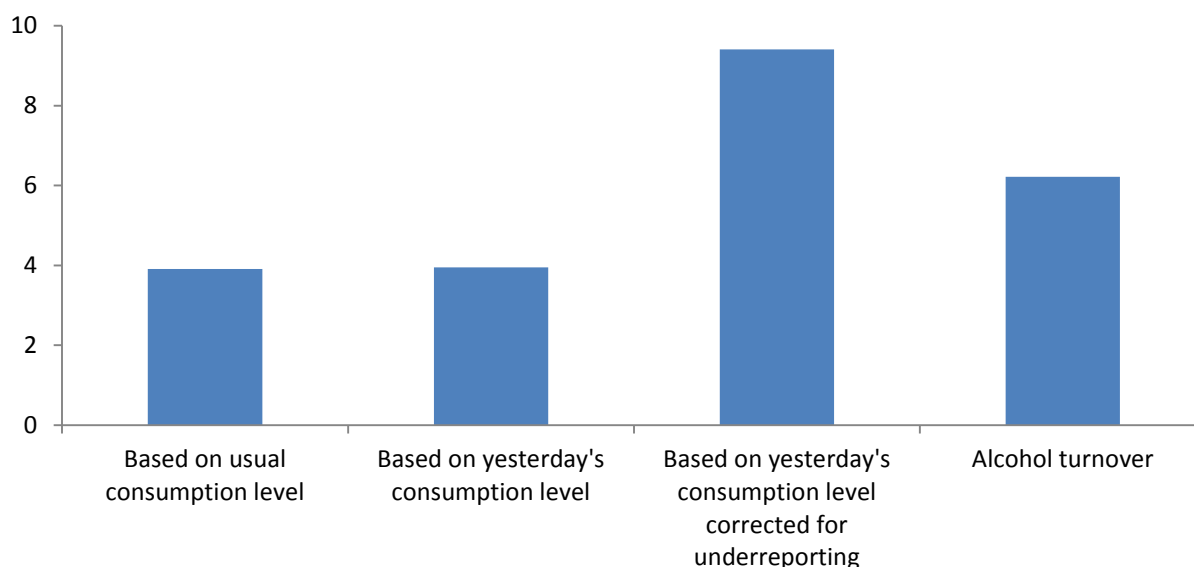
Source: RusStat

We see that beer was the type of alcohol that sold the most in 2011 in terms of litres of pure alcohol per capita (2.8 litres), followed by wine (2.4 litres), spirits (1.3 litres) and alco pops (0.1 litres). On average, Norwegians above the age of 15 had a total registered consumption level of 6.6 litres of pure alcohol. This is equivalent to approximately 8.5 bottles of beer per week.

### 2.2.2 Norwegians underreport their consumption level

Figure 2-5 shows the estimated average alcohol consumption for individuals above 15 years of age in 2004, using the estimation methods described in Chapter 2.1.2 in addition to the registered alcohol consumption.

*Figure 2-5 Alcohol turnover and estimated average consumption of alcohol per person above 15 years of age based on different estimation methods, litres of pure alcohol, 2004*



Source: Horverak and Bye (2007)

Both estimates are below the average alcohol sales level of 6.2 litres of alcohol in 2004. This shows that there is a problem of underreporting when asking about individuals' alcohol consumption in interviews or questionnaires.

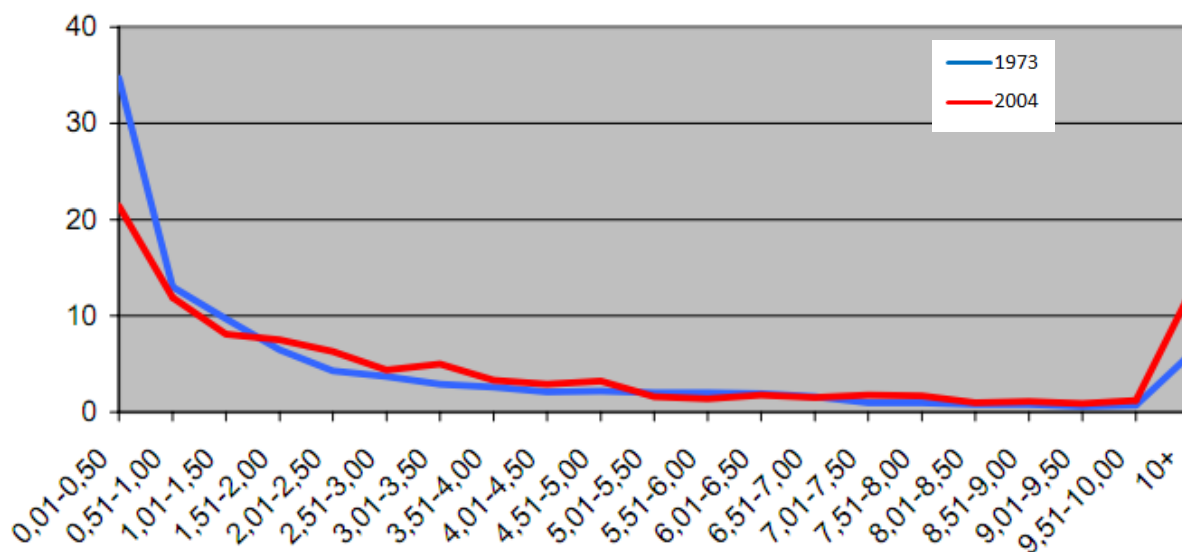
Assuming that the respondents only reported 42 per cent of their actual alcohol consumption when asked about their consumption the previous day, the average total consumption per person was equal to 9.4 litres of alcohol in 2004. Using this estimate for the total alcohol consumption, only 66 per cent of the consumed alcohol in Norway in 2004 was registered. The remaining 34 per cent was purchased abroad, in duty free shops, produced at home or purchased illegally in Norway.

Assuming that these proportions were the same in 2011, the estimated average total alcohol consumption per person was equal to 10 litres of pure alcohol in 2011.

### 2.2.3 Skewed distribution of alcohol

Unless the distribution of alcohol consumption in the Norwegian population is known, the average alcohol consumption does not tell us anything about the proportion of Norwegians who drink excessively nor who are abstinent. Figure 2-6 (Horverak and Bye, 2007) shows the distribution in the Norwegian alcohol consuming population in 1973 and 2004, and is based on data from interviews about alcohol consumption.

Figure 2-6 Alcohol consumption by litres of pure alcohol distributed on consumers, per cent, 1973 and 2004



Source: Horverak and Bye (2007)

The alcohol consumption is not normally distributed. There is a greater proportion of the population who drink very little, than who drink the average amount. The distribution is in other words skewed.

In 1973 35 per cent of the population consumed less than half a litre of alcohol per year. In 2004 this proportion had been reduced to 21 per cent. The proportion of the population who consumed more than 10 litres of alcohol per year had on the other hand increased from 6 per cent in 1973 to 12 per cent in 2004. In other words, in the period between 1973 and 2004 it became less common to have a low consumption level of alcohol, and more common to have a high consumption level. The distribution in 2004 is shifted to the right compared to the one in 1973.

Furthermore, the 10 per cent of the population who consumed the most in 1973 consumed on average 7.4 litres of alcohol per year (Horverak and Bye, 2007). The consumption of this group constituted half of the total consumption in the population. In 2004 the consumption of the 10 per cent who consumed the most only constituted 46 per cent of the total alcohol consumption, but the average consumption per individual in this group had increased to 11.3 litres of alcohol.

The median alcohol consumption had increased from 1.1 litres in 1973 to 2.1 litres in 2004. This is lower than the average alcohol consumption in the respective years. The median consumption level gives us a much better idea of how much most Norwegians drink than the average consumption level does.

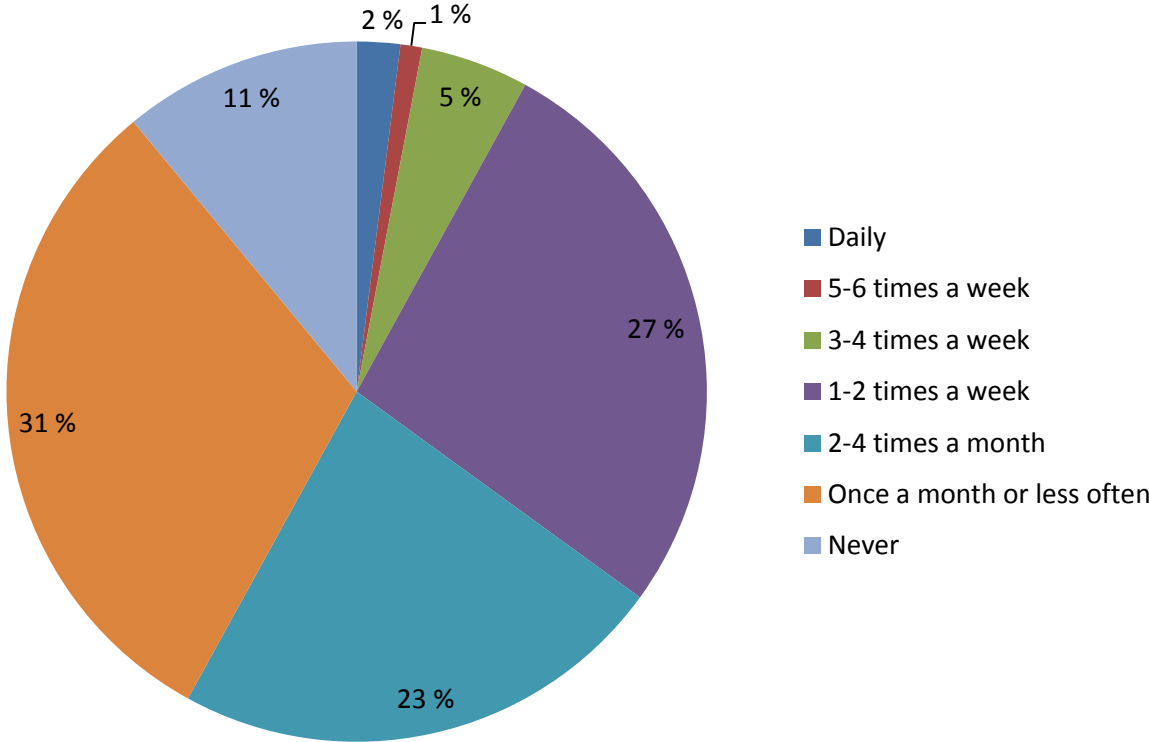
The proportion of the Norwegian population who do not consume alcohol was estimated to be 13 per cent in 1999 (Nordlund, 1996; Mäkelä, 1999). This estimate is also used in a more recent article that attempts to estimate the social costs related to alcohol (Gjelsvik, 2004). The non-consumers were those who had not consumed any alcohol over the last year.

The alcohol consumption is not evenly distributed geographically. The average consumption level is higher in and around Oslo than in the rest of the country. People in the west and in the south of Norway have the lowest average consumption level (Saglie, 1994).

2.2.4 More than one third of the Norwegian population drink 1-2 times a week or more often

Figure 2-7 shows the frequency of alcohol consumption in the Norwegian population.

Figure 2-7 Frequency of alcohol consumption in the Norwegian population, 2008



Source: Blå Kors<sup>7</sup>

35 per cent of the Norwegian population drink 1-2 times a week or more often. This does not say anything about how much people drink every time they drink. Furthermore, Oslo has the highest proportion of frequent drinkers, whilst Møre og Romsdal has the lowest proportion.

Other characteristics of the Norwegian population is that people with a high level of education drink more often than people with a low level of education. The same positive relationship is present for income - individuals with a high income drink more often than individuals with a lower income.

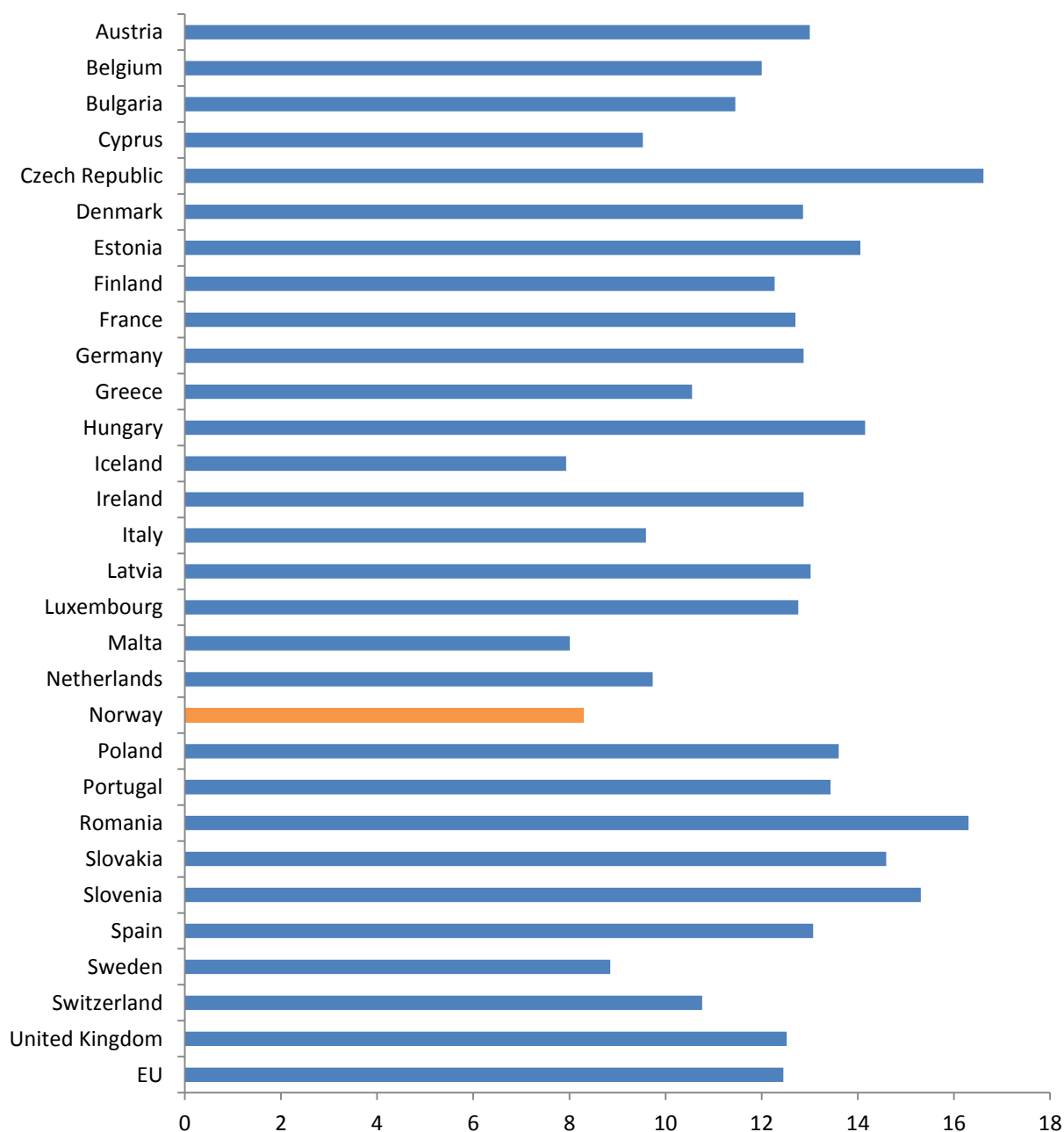
<sup>7</sup> <http://www.blakors.no/pdf/Delrapport1-AlkoholOgMegSelv.pdf>



### 2.3 Norwegians drink less than most Europeans, but have a more detrimental drinking pattern

The total per capita consumption of pure alcohol is lower in Norway than in most other European countries. Statistics from 2009 show that it is only Iceland and Malta that have a lower per capita consumption level. The countries with the highest per capita level of consumption are the Czech Republic and Romania. See Figure 2-8.

Figure 2-8 Total per capita consumption in litres of pure alcohol, 2009



Source: Rehm et al. (2012)

The drinking pattern in Norway is however more detrimental than in some of the countries that have a higher consumption level (Rehm et al., 2012). On a scale from one to five, where one is the least hazardous drinking pattern characterised by regular drinking, often with meals, and without heavy drinking bouts, and five is the most hazardous characterised by infrequent but heavy drinking outside of meals, Norway has a score of 3.

The score is calculated based on a numerous characteristics of the alcohol consumption, including the frequency of heavy drinking occasions, usual quantity per drinking occasion, binge drinking over prolonged times, drinking at special occasions and events, drinking with meals and drinking in public places.

Countries in Europe with the same score as Norway are Finland, Sweden, Estonia, Hungary, Iceland, Ireland, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and United Kingdom. The drinking pattern in Bulgaria, Denmark and Greece is less hazardous than the one in Norway, and is given a score of 2. Austria, Belgium, Cyprus, France, Germany, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain and Switzerland have the least hazardous drinking pattern in Europe, and are given a score of 1.

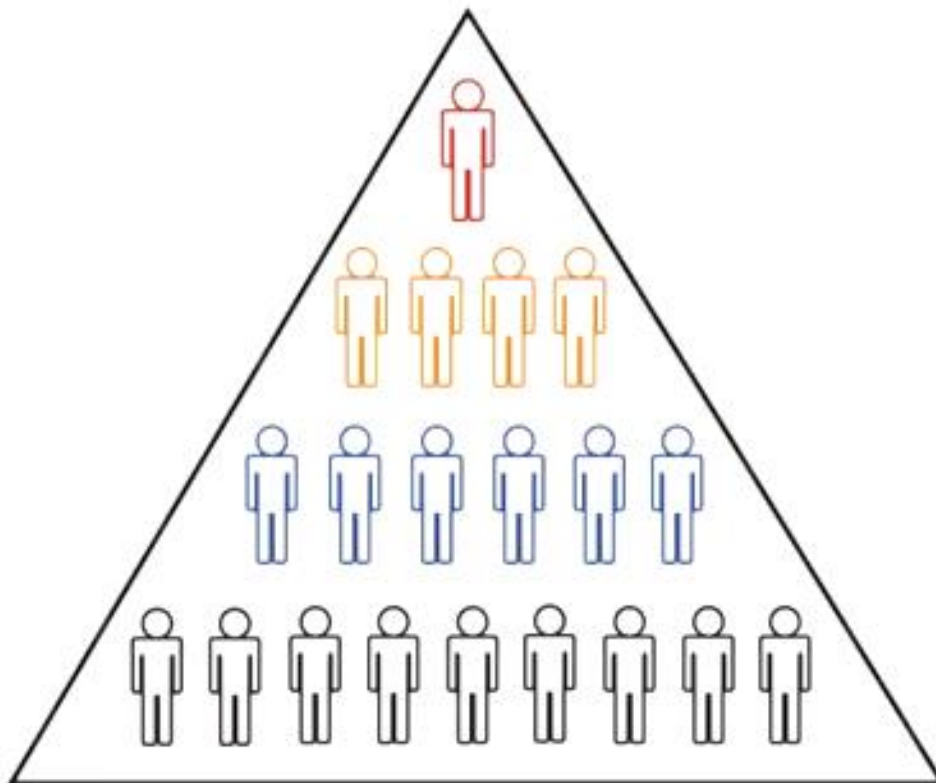
The average score in the EU is 2.1. The Norwegian drinking pattern is in other words more hazardous than the average in EU.

### 3 Use, abuse and addiction

As discussed in Chapter 1, alcohol has played an important role in the Norwegian society for a long time. The majority of the Norwegian population consume alcohol in a non-harmful way, and for these individuals alcohol is a consumer good that brings utility and joy. Some people on the other hand, consume alcohol in such a way that it can be harmful for both themselves and for the people around them. These people abuse, and are in some cases addicted to, alcohol.

Figure 3-1 illustrates how alcohol consumption and problems related to alcohol consumption is distributed in the Norwegian population.

*Figure 3-1 The alcohol pyramid*



Source: H. Lundbeck AS

The individuals at the bottom of the pyramid are the ones who consume alcohol in moderate amounts. This is the majority of the population, and their drinking pattern is non-harmful. As we move up the pyramid, the alcohol consumption increases, and so does the problems related to alcohol consumption.

The people at the very top of the pyramid are the ones with the greatest alcohol-related problems. Their drinking might have caused them to lose their job, and they are likely to have complex psychological and physical illnesses.

A group of individuals that is often forgotten is the group of people in the middle of the pyramid. These individuals have a harmful drinking pattern that causes risk of illness, crime and social problems, but they are not the ones with the most severe problems. As their alcohol consumption is problematic in the sense that it might cause problems for themselves and others, it can be characterised as abuse. It is likely that these individuals have a high risk of developing acute problems and chronic harm, and that they have a mild dependency problem. The group is however not uniform - drinking patterns and dependency varies from individual to individual, and it might not be obvious to people around them that they have a problem.

In the following, we discuss the terms use, abuse and addiction, and provide data on the number of people in Norway who abuse alcohol or who have a problematic drinking pattern, and of the number of people who are dependent on alcohol. The discussion is mainly based on the article «What is Abuse and Addiction? Descriptions, Concepts and Magnitude»<sup>8</sup> by Amundsen et al. (2010).

### 3.1 Alcohol use

The history of alcohol use indicates that alcohol has been enjoyed for thousands of years. In contrast to tobacco, alcohol may be used in modest amounts without creating health problems. In contrast, there is evidence that a modest intake of alcohol reduces the risk of cardiovascular disease (Ronksley et al., 2011). A minority of alcohol is consumed by people addicted to alcohol, while the majority is consumed after conscious decisions by people who are able to say no.

### 3.2 The difference between alcohol use and abuse

Some substances can both be *used* and *abused*, whilst others can only be used, and consumption of others again are always characterised as abuse. Tobacco is an example of a substance that is used and never abused. On the other hand, consumption of heavy drugs such as heroin may always be characterised as abuse. Alcohol is an example of a substance that can both be used and abused.

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<sup>8</sup> In Norwegian: «Hva er misbruk og avhengighet? Betegnelser, begreper og omfang».

It is not only the intoxicating effect and whether the substance is legal or not which determines if consumption of a substance is characterised as abuse or use<sup>9</sup>. Other factors that might affect the characterisation are quantity, frequency, cultural status of the substance, dependency, acute effects on health and the ability to work, economic consequences and the effects on inter-personal relationships. Most of these factors are interconnected.

It is difficult to draw a clear line between alcohol use and abuse. For example, two people with the same yearly consumption level might have different drinking patterns where one consumes small amounts frequently and the other consumes considerable amounts on rare occasions. Because of the differing drinking patterns and thus the differing intoxicating effects, inter-personal relationships and the ability to work, as well as the possible differing economic consequences, one person's consumption of alcohol might be characterised as abuse, while the other's consumption is characterised as alcohol use.

### **3.3 What is alcohol abuse and how many Norwegians abuse alcohol?**

SIRUS<sup>10</sup> characterise people who on average consume more than 10 cl alcohol a day (36.5 l a year) as *excessive alcohol consumers*<sup>11</sup>. Excessive drinking, as it is defined here, is easier to relate to than the term abuse, as it is difficult to draw a clear line between use and abuse.

WHO has also defined different risk levels for acute problems and chronic harm in terms of average consumption of alcohol per day (WHO, 2000). Table 3-1 defines the different risk levels in terms of grams of pure alcohol and in alcohol units.<sup>12</sup>

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<sup>9</sup> Amundsen et al (2010).

<sup>10</sup> Statens institutt for rusmiddelforskning.

<sup>11</sup> «Storforbrukere».

<sup>12</sup> Based on the assumption that 1 alcohol unit is equal to 12 grams of pure alcohol.

*Table 3-1 Categorical levels for average volume of pure alcohol and alcohol units per day for men and women*

Category	Average volume of pure alcohol (g) and alcohol units per day for men, g / units	Average volume of pure alcohol (g) and alcohol units per day for women, g / units
<b>WHO-Criteria for risk of consumption on a single drinking day in relation to acute problems</b>		
Low risk	0-40 / 0-3	0-20 / 0-1.5
Medium risk	41-60 / 3-5	21-40 / 1.5-3
High risk	61-100 / 5-8	41-60 / 3-5
Very-high risk	>100 / >8	>60 / >5
<b>WHO-Criteria for risk of consumption on a single drinking day in relation to chronic harm</b>		
I (Low risk)	0-40 / 0-3	0-20 / 0-1.5
II (Medium risk)	41-60 / 3-5	21-40 / 1.5-3
III (High risk)	>60 / >5	>40 / >3

Source: WHO (2000)

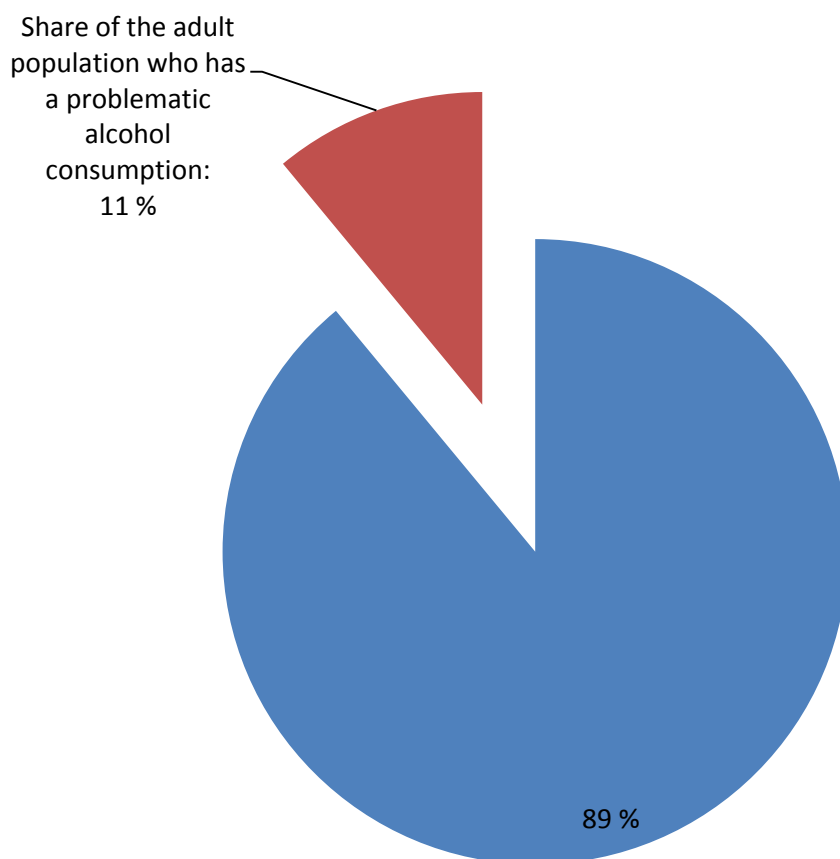
Alcohol abuse is connected to several problems caused by drinking, and the term “problematic” or “harmful” alcohol consumption is therefore often used in connection with, or instead of, abuse.

The UK National Institute for Health and Care Excellence (NICE) define harmful drinking as a pattern of alcohol consumption causing health problems directly related to alcohol.

Alcohol Use Disorder Identification Test (AUDIT) is an internationally recognised instrument used to identify people with problematic alcohol consumption. It is a set of questions about the amount and frequency of alcohol consumption, dependency and negative consequences (for example bad conscience, injuries and black-outs) of alcohol consumption. These three groups of questions coincide with how the World Health Organisation (WHO) defines problematic use of substances in the International Classification of Diseases (ICD-10).

The characteristics of individuals classified as abusers might differ to some extent. One individual might be classified as an abuser because of a high score on the dependency questions, while another might be classified as an abuser because of the large negative effects of his or her alcohol consumption. This attribute to the group of alcohol abusers is illustrated by the results from a survey in Oslo in 1995 (Fekjær, 1996). Even though there was a positive relationship between alcohol consumption and problems caused by drinking, individuals with problematic alcohol consumption differed from each other, in some cases to a great extent, in total consumption level and frequency of drinking. 30 per cent of the individuals with problematic alcohol consumption had consumed less than two litres of alcohol in the last 12 months, and 40 per cent of them had consumed alcohol less than five times a month.

*Figure 3-2 Proportion of the adult population who has a problematic alcohol consumption*



Source: Oslo Economics/Fekjær (1996)

According to Fekjær (1996), 11 per cent of the population aged 18-59 in the Norwegian capital have experienced considerable or severe problems because of their alcohol consumption over the last 12 months. This number is based on the results from the 1995 survey where the respondents were asked if they in connection with their drinking had experienced harm/injury, fight, confrontation, criticism from others, work absenteeism, health problems, illness or if they had broken the law. 11 per cent of the respondents had experienced at least 3 of these problems.

As people in Oslo consume alcohol more frequently and have a higher average consumption level than people elsewhere in Norway, one can assume that the proportion of the total Norwegian population aged 18-59 who have a problematic consumption level is somewhat lower than 11 per cent.

### **3.4 The difference between alcohol abuse and addiction**

Even though many alcohol abusers also have a dependency problem, addiction is not the same as abuse. Dependency can be seen as a physical or mental condition in which the individual has limited control over his or her actions.

Alcohol dependency exists on a continuum of severity, but it is sometimes useful to subdivide dependence into categories of mild, moderate and severe (NICE). People with a mild dependency problem do not usually need assisted alcohol withdrawal. Individuals with a moderate dependency problem usually need assisted alcohol withdrawal, whilst individuals with severe problems always need such assisted withdrawal. The degree of severity indicates the appropriate type of intervention.

It is possible to abuse alcohol and other substances without being dependent or addicted to it. Conversely, some people might say they are addicted to a substance at the same time as the consumption of this substance is not being characterised as abuse. This is true for cigarettes and coffee, but not for alcohol.

Because alcohol abuse and addiction are interconnected, but not mutually exclusive, the population that abuse alcohol is not identical to the population being addicted to alcohol, but the two populations are overlapping.

In the updated DSM system (DSM-5), published in May 2013, there is not a clear distinction between dependence and abuse. Instead it refers to Alcohol Use Disorders (AUD). Whether a patient has mild, moderate or severe substance use disorder depends on the number of symptom counts of the 11 diagnostic criteria. The reasoning behind not having a clear diagnostic distinction is that the alcohol-related problems occur on a continuum of severity. The abuse-dependence distinction is thus somewhat arbitrary. There is still a difference between people on each end of the severity scale, the problem is that it is difficult to know exactly when a person moves from abuse to dependence.

### **3.5 Alcohol addiction is a disease**

As mentioned above, a common explanation of addiction is that it is a physical or mental disease. There is high probability of a chronic, relapsing, and progressive course, which has both biological and behavioural components.

Many empirical studies show that individuals who are addicted to different substances are influenced by their surroundings and are able to choose their actions. Hence, one should not assume that individuals who are addicted to a substance have lost all control of their actions.



On the other hand, the well-established ambivalence and motivational conflict involved in dependence makes it unsatisfactory to view it as pure rational behaviour, as is done in the Rational Addiction theory of Becker and Murphy (1988). They develop a theory where addicts are rational individuals fully informed and aware of the long-term negative consequences of the addictive good. “Addictions” in this theory are nothing more than a specific type of optimal, utility-maximizing consumption plans. The theory does however not explain the behaviour of individuals who try to get out of addiction without success. A rational individual will quit if he or she wants to quit, and if he or she does not quit, it is because the individual does not want to quit. A motivational conflict can never exist within a rational human being.

Several researchers have attempted to bridge this gap between self-control problems on the one hand, and incentive-responsive choices on the other. Ainslie and Monterosso (2009) focus on how people value things less if they are delayed in time. If an individual is to choose between a small reward today and a larger reward in the future, it will prefer the larger future reward before the actual decision has to be made. However, upon deciding, the utility of the small reward today seems greater than the larger reward in the uncertain future. The individual will give in to the temptation and choose the smaller reward today.

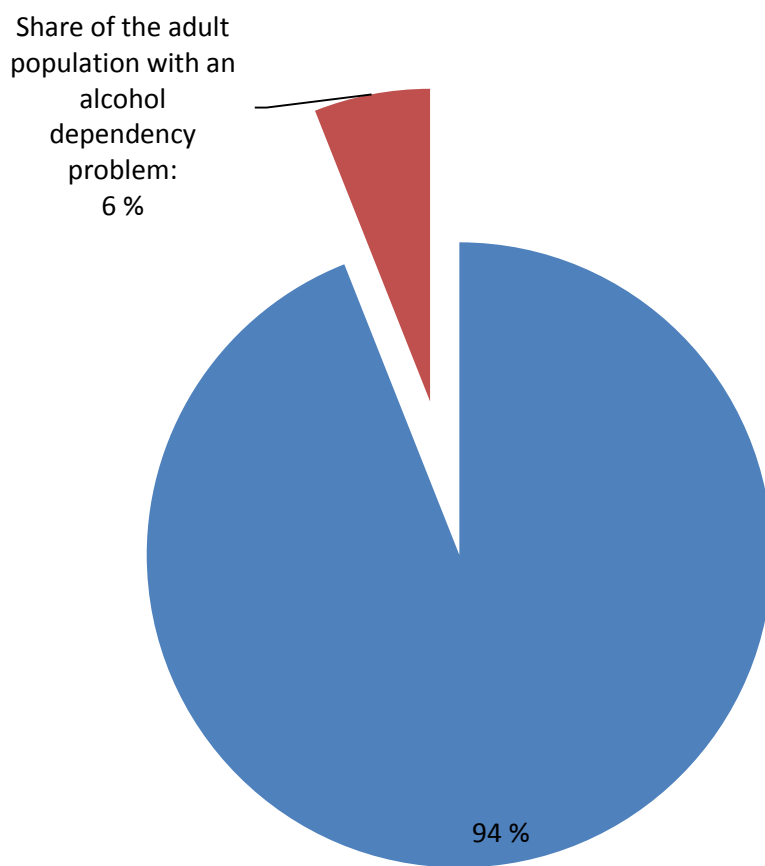
Others, such as Kent Berridge and economists Bernheim and Rangel, have argued that different cognitive systems interplay when we make decisions. Automatic and almost immediate gut feelings and impulses and hunches come from one system, while the other (conscious thought) is slower and requires effort. Addictions are linked to an effect of the addictive good on our impulses - alcohol increases our “wanting” of alcohol more than its actual pleasurable effects would justify.

An addiction can be characterised by a very large appetite for something, which creates a motivational conflict within the individual. It also involves a certain degree of loss of freedom, as the addiction induces reduced self-control and autonomy (Levine, 1978; Jellinek, 1960). Prolonged use of alcohol can give neural damages that heal slowly.

Furthermore, several studies have established that alcoholism is hereditary. Genetic factors are estimated to account for as much as 40-60 per cent of the risk of developing alcoholism (Nestler, 2000; Schuckit, 2002).

These characteristics support the view of addiction being a disease, and individuals with a disease have the right to be treated for their condition.

*Figure 3-3 Proportion of the adult population with an alcohol dependency problem*



Source: Oslo Economics/Rehm et al. (2012)

According to Rehm et al. (2012), the 12-month prevalence of alcohol dependency among Norwegian men and women aged 18-64 is 10.5 and 3.5 per cent respectively. This is equivalent to 154 500 men and 50 000 alcohol dependent women in this age group. The total 12-month alcohol dependency prevalence is 6.6 per cent. This estimate is based on an article by Kringlen et al. (2001) called “A Norwegian Psychiatric Epidemiological Study”. It is based on numbers from a survey in Oslo. As mentioned, the amount and frequency of alcohol consumption is higher among people living in Oslo than among people living elsewhere in Norway, and the correct alcohol dependency prevalence is thus likely to be somewhat lower than the estimate given by Rehm et al. (2012).

People living in Sogn og Fjordane drink less often than people living in Oslo, and the county has a higher proportion of abstainers. The 12-month prevalence of alcohol dependence is 1.7 per cent for men, 0 per cent for women, and 0.8 per cent for the total adult population (Kringlen et al., 2006).

## 4 Negative consequences of alcohol

Figure 4-1 illustrates the different consequences of alcohol consumption and abuse that creates costs for society and individuals.

*Figure 4-1 Types of negative consequences (costs) of alcohol*



Source: Oslo Economics

Health consequences of alcohol consumption are increased or reduced mortality and morbidity depending on the level of consumption and subsequently increased or reduced health care costs (Rehm et al, 2012). Several studies find a positive relationship between alcohol and crime, and the relationship may be causal (Grönqvist and Niknami, 2011). The proportion of perpetrators that are under influence of alcohol is high for most criminal offences (Gjelsvik, 2004), and criminal offences are costly for society. Alcohol consumption may also reduce productivity through increased work absenteeism and unemployment, decreased quality of work and early deaths (Grimsmo and Rossow, 1997; US, 1970). Furthermore, use of alcohol may have a negative impact on those living together with individuals with a high consumption level. This negative effect is particularly high for children living with parents with alcohol problems (Gjelsvik, 2004). High consumption levels are also associated with divorce (Fekjær, 1987).

## 4.1 Serious health consequences from alcohol abuse

It is well-documented that alcohol consumption can lead to several diseases. In addition to diagnoses that by definition are caused by alcohol, for example alcoholic cardiomyopathy, alcohol consumption also increases the risk of several other diseases like liver cirrhosis and different types of cancer. It also increases the risk of different types of injuries, for example fall injuries, drowning and traffic accidents. This means that alcohol consumption increases the morbidity and the mortality in the Norwegian population.

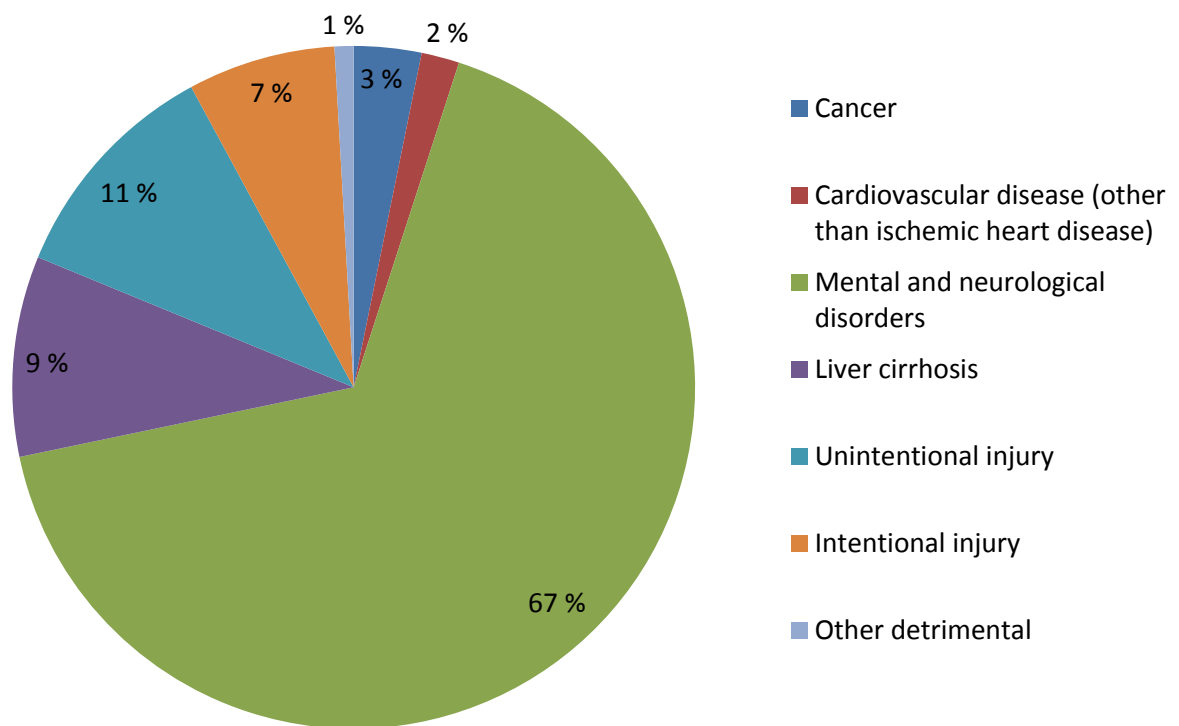
### 4.1.1 Mental and neurological disorders from alcohol contribute the most to the alcohol-related loss in health

Years of life lost due to disability (YLD) is a measure of the burden of disease attributed to the consumption of alcohol. According to Rehm and Shield (2012), 20.0 per cent of the total years of life lost due to disability (YLD) for men in the Nordic countries can be attributed to alcohol. For women, only 4.2 per cent of the YLD can be attributed to alcohol. Furthermore, 17.2 per cent of the total disability-adjusted life years (DALY) for men are alcohol attributable, whilst the proportion for women is 4.7 per cent in the Nordic countries. DALY is a measure of all years of life lost due either to premature mortality, or to living with a disability, and thus connects measures of morbidity and mortality.

In the recent report from the Global Burden of Disease Study 2010, alcohol use disorders rank number 22 in Western Europe in terms of DALYs lost (Murray et al., 2012). It should be noted that in this ranking, several alcohol-related diseases such as cardiovascular disease, injuries, liver disease and others were reported separately.

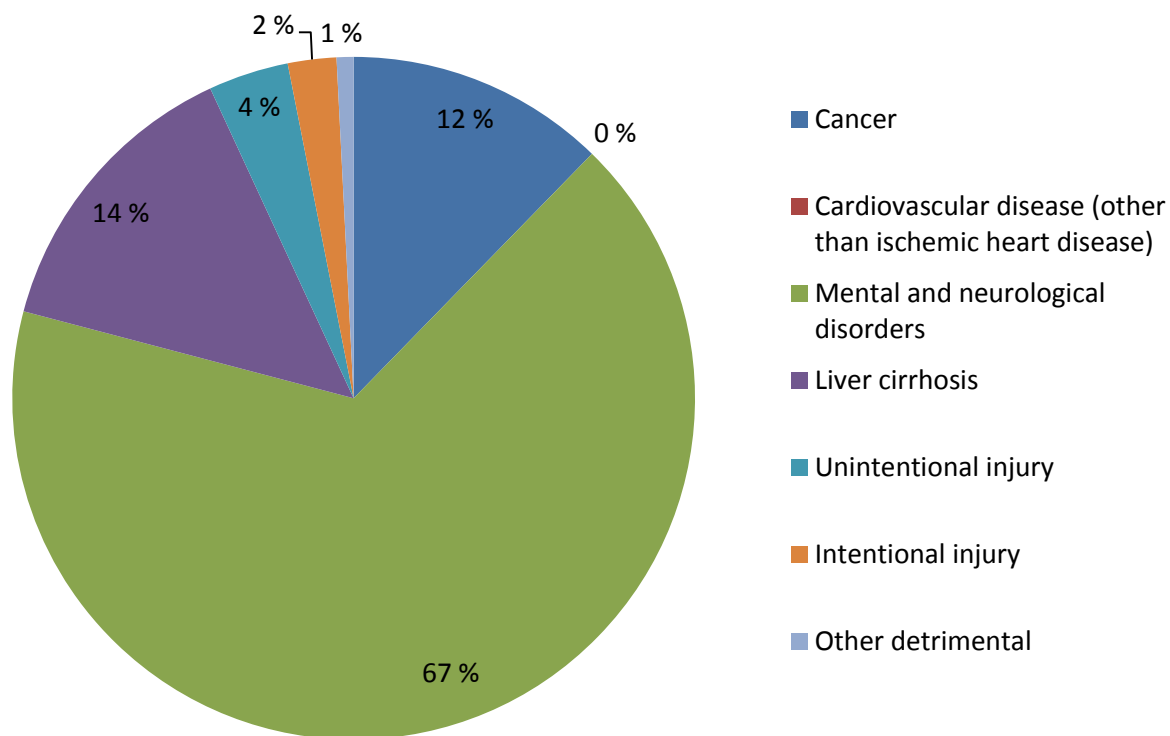
The figures and table below indicate the alcohol-attributable burden of disease in DALYs, by broad disease categories for men and women between 15 and 64 years of age living in the Nordic countries in 2004.

Figure 4-2 Proportion of alcohol-attributable burden of disease in DALYs caused by different diseases, men aged 15-64 living in the Nordic countries, 2004



Source: Oslo Economics/Rehm et al. (2012)

Figure 4-3 Proportion of alcohol-attributable burden of disease in DALYs caused by different diseases, women aged 15-64 living in the Nordic countries, 2004



Source: Oslo Economics/Rehm et al. (2012)

*Table 4-1 Proportion of alcohol-attributable burden of disease in DALYs caused by different diseases, for people aged 15-64 living in the Nordic countries, 2004*

Disease	Men	Women
Cancer	3.2	12.3
Cardiovascular disease (other than ischemic heart disease)	1.8	0.0
Mental and neurological disorders	66.8	66.8
Liver cirrhosis	9.5	14.0
Unintentional injury	10.9	3.8
Intentional injury	7.0	2.3
Other detrimental	0.9	0.8
Total detrimental	100.0	100.0

Source: Rehm and Shield (2012)

We see that as much as 66.8 per cent of the alcohol-attributable DALYs are caused by mental and neurological disorders for both men and women. For men, liver cirrhosis and unintentional injuries are also important contributors to alcohol-attributable DALYs. Cancer is a greater contributor than unintentional injuries for women.

### *Patient contacts in Norway*

In the following, we present statistics on the health-related impacts of alcohol in Norway<sup>13</sup>. The figures and tables below present the number of patient contacts by diagnosis in in-patient care in public somatic care. Several of the diagnoses, such as alcoholic polyneuropathy and alcoholic myopathy, are by definition caused by alcohol, whilst others, like angina pectoris and pneumonia, are multifactorial and alcohol is only one of several causal factors. For some of these diseases there is a clear positive relationship between alcohol consumption and risk of developing the disease. For diseases such as ischemic heart disease and ischemic stroke however, the relationship is complicated in that many studies indicate that alcohol has a protective effect when consumed in small to moderate amounts (Rehm et al., 2012; Ronksley et al., 2011). A recent report from the Norwegian Knowledge Centre for the Health Services (NOKC) concludes that a daily intake of 100 g alcohol per day increases the risk of haemorrhagic stroke (ICD-10 codes I61 and I62) with a relative risk of

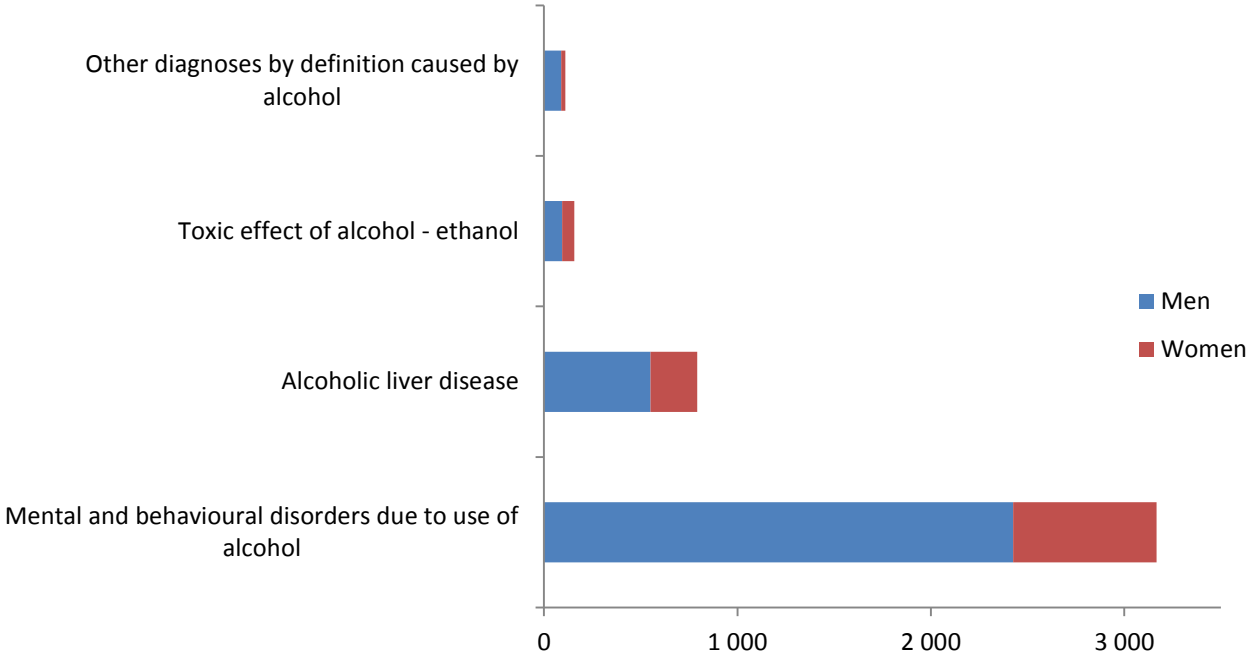
<sup>13</sup> The tables are based on data extraction from the Norwegian Patient Register (NPR) of the following diagnoses: I20

I21, I22, I23, I24, I25, I60, I61, I62, I63, K70, K74, K85, K86.0, K86.1, J10, J11, J12, J13, J14, J15, J16, J17, J18, J20, J21, J22, X4n, W0n, X0n, W7r, X6n, X8n, Y3n, Y1n, Y87.1, V0n, V1n, V2s, V2t, V4n, V5n, V6n, V7n, V9s, V9t, V98, V99E244, G312, G621, &721, I426, K292, K852, K860, T510, T519, R780, Z721, Z502, Z714, F100, F1000, F1001, F1002, F1003, F1004, F1005, F1006, F1007, F101, F102, F1020, F1021, F1022, F1023, F1024, F1025, F1026, F103, F1030, F1031, F104, F1040, F1041, F105, F1050, F1051, F1052, F1053, F1054, F1055, F1056, F106, F107, F1070, F1071, F1072, F1073, F1074, F1075, F108, F109.

4.7 (95 per cent CI 3.35-6.59). It probably also increases the risk of ischaemic stroke (ICD-10 code I63) with a relative risk of 4.37 (95 per cent CI 2.28-8.37). Additionally, there might be a negative impact on biomarkers and coronary heart disease, but the impact here is less certain. On the other hand, there is probably an advantageous effect on the level of HDL-cholesterol and fibrinogen in the short term.<sup>14</sup>

Figure 4-4 shows the most frequently used diagnoses that by definition are caused by alcohol. Diagnoses that were used less than 100 times are grouped together in the category “Other diagnoses by definition caused by alcohol”. Details of these diagnoses can be found in Table 4-2.

*Figure 4-4 In-patient care: Most frequent admissions for diagnoses caused by alcohol, public somatic care, 2011*



Source: Oslo Economics/Norwegian Patient Register

The most frequent admissions are for mental and behavioural disorders due to use of alcohol, alcoholic liver disease and toxic effect of alcohol (ethanol). Men are overrepresented for all of these diagnoses.

<sup>14</sup> The Norwegian Knowledge Centre for the Health Services (2013).



Table 4-2 presents in more detail the number of patient contacts by ICD-10 and diagnosis in in-patient care in public somatic care. The diagnoses that by definition are caused by alcohol are highlighted.

*Table 4-2 In-patient care: Number of patient contacts (hospital stays) for alcohol-related conditions by main diagnosis for age group 19+, public somatic care, 2011<sup>15</sup>*

ICD-10	Diagnosis	In total	Male	Female
F10	Mental and behavioural disorders due to use of alcohol	3,166	2,426	740
G312	Degeneration of nervous system due to alcohol	22	16	6
G621	Alcoholic polyneuropathy	21	19	2
G721	Alcoholic myopathy	2	2	0
I20	Angina pectoris	9,167	5,690	3,477
I21	Acute myocardial infarction	17,338	11,614	5,724
I22	Subsequent myocardial infarction	1,191	806	385
I23	Certain current complications following acute myocardial infarction	18	12	6
I24	Other acute ischaemic heart diseases	55	35	20
I25	Chronic ischaemic heart disease	10,270	7,575	2,695
I426	Alcoholic cardiomyopathy	3	3	0
I60	Subarachnoid haemorrhage	683	273	410
I61	Intracerebral haemorrhage	1,662	899	763
I62	Other nontraumatic intracranial haemorrhage	509	334	175
I63	Cerebral infarction	8,599	4,474	4,125
J10	Influenza due to other identified influenza virus	157	73	84
J11	Influenza with pneumonia, virus not identified	213	108	105
J12	Viral pneumonia, not elsewhere classified	154	68	86
J13	Pneumonia due to Streptococcus pneumonia	625	309	316
J14	Pneumonia due to Haemophilus influenza	268	135	133
J15	Bacterial pneumonia, not elsewhere classified	15,413	8,132	7,281
J16	Pneumonia due to other infectious organisms, not elsewhere classified	41	21	20
J17	Pneumonia in diseases classified elsewhere	33	20	13
J18	Pneumonia, organism unspecified	6,470	3,501	2,969
J20	Acute bronchitis	785	348	437
J21	Acute bronchiolitis	26	12	14
J22	Unspecified acute lower respiratory infection	1,678	803	875
K292	Alcoholic gastritis	20	17	3
K70	Alcoholic liver disease	792	551	241
K74	Fibrosis and cirrhosis of liver	313	163	150
K85	Acute pancreatitis	1,762	956	806
K860	Other diseases of pancreas	182	148	34
K861	Other chronic pancreatitis	330	172	158

R780	Finding of alcohol in blood	1	0	1
T510	Toxic effect of alcohol - ethanol	156	94	62
T519	Toxic effect of alcohol - alcohol, unspecified	19	14	5
Z502	Alcohol rehabilitation	1	1	0
Z714	Alcohol abuse counselling and surveillance	1	1	0
Z721	Problems related to lifestyle - alcohol use	20	16	4

Source: Norwegian Patient Register

For the diagnoses directly related to alcohol there were in total 4,224 patient contacts in in-patient care in public somatic care in 2011. Men were overrepresented with 3,160 patient contacts, compared to 1,064 patient contacts for women.

For most of the other diagnoses, we cannot conclude about the proportion of patients attributable to alcohol consumption. We do however know that consumption of alcohol increases the risk of contracting these diseases, and have thus included number of patient contacts for these diagnoses as well.

For the diagnoses I61, I62 and I63, we can calculate the alcohol-attributable proportion of patient contacts. The article from the Norwegian Knowledge Centre for the Health Services<sup>16</sup>, concludes that the relative risk of I61 and I62 (haemorrhagic stroke) is 4.7 when the daily alcohol intake equals 100 g. The relative risk of I63 (ischaemic stroke) is 4.37. If we conservatively assume that the proportion of the Norwegian adult population who daily consume 100 g of alcohol is 6 per cent, i.e. equal to the proportion with a dependency problem, we can calculate the population attributable risk (PAR) of developing haemorrhagic stroke and ischaemic stroke. We find that the PAR of developing haemorrhagic stroke (I61 and I62) is 18.2 per cent, and that the PAR of developing ischaemic stroke (I63) is 16.8 per cent.

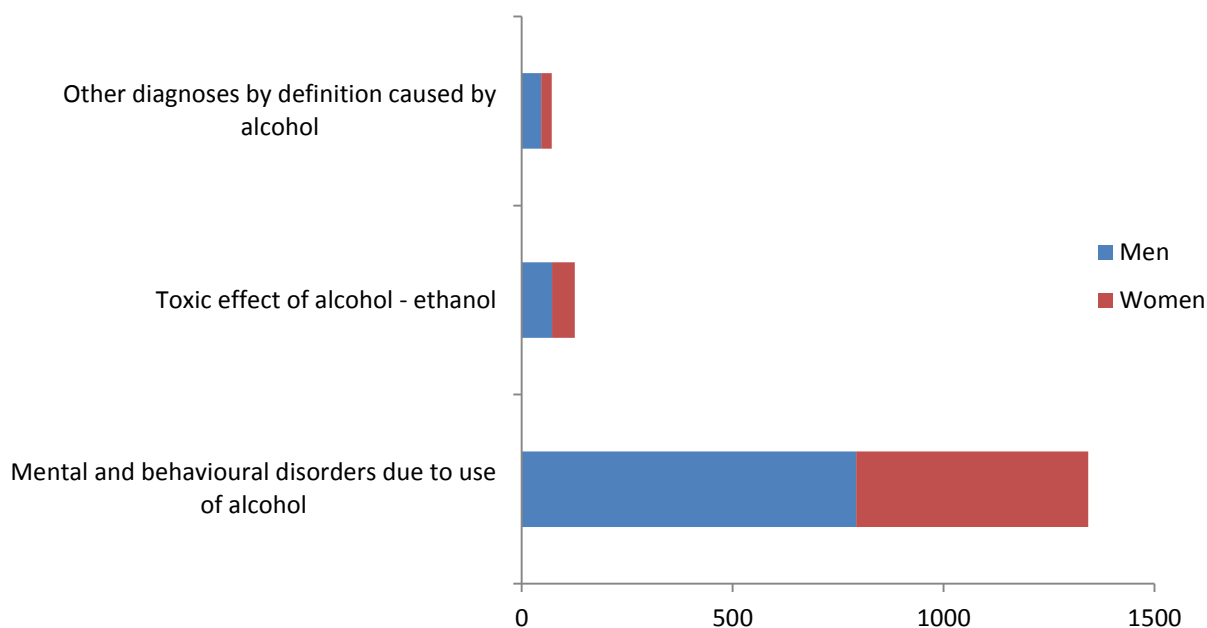
This indicates that in in-patient care in public somatic hospitals, the number of alcohol attributable patient contacts with diagnosis I61, I62 and I63 was 302, 93 and 1,445 respectively in 2011.

Figure 4-5 shows the most frequently used diagnoses that by definition are caused by alcohol in day care in public somatic care in 2011. Again, diagnoses that were used less than 100 times are grouped together in the category “Other diagnoses by definition caused by alcohol”.

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<sup>16</sup> The Norwegian Knowledge Centre for the Health Services (2011).

Figure 4-5 Day care: Most frequent admissions for diagnoses caused by alcohol, public somatic care, 2011



Source: Oslo Economics/Norwegian Patient Register

As for in-hospital care, the most frequently used diagnoses in day care were mental and behavioural disorders due to use of alcohol and toxic effect (ethanol). Men are overrepresented in the number of patient contacts.

Table 4-3 shows in more detail the number of patient contacts in day care in public somatic care by main diagnosis in 2011.

Table 4-3 Day care: Number of patient contacts for alcohol-related conditions by main diagnosis for age group 19+, public somatic care, 2011

ICD-10	Diagnosis	In total	Male	Female
E244	Alcohol-induced pseudo-Cushing syndrome	1	0	1
F10	Mental and behavioural disorders due to use of alcohol	1,343	793	550
G312	Degeneration of nervous system due to alcohol	3	2	1
G621	Alcoholic polyneuropathy	3	2	1
I20	Angina pectoris	2,050	1,334	716
I21	Acute myocardial infarction	1,219	840	379
I22	Subsequent myocardial infarction	37	25	12
I23	Certain current complications following acute myocardial infarction	4	3	1
I24	Other acute ischaemic heart diseases	4	3	1
I25	Chronic ischaemic heart disease	5,311	3,906	1,405
I426	Alcoholic cardiomyopathy	1	1	0
I60	Subarachnoid haemorrhage	61	27	34

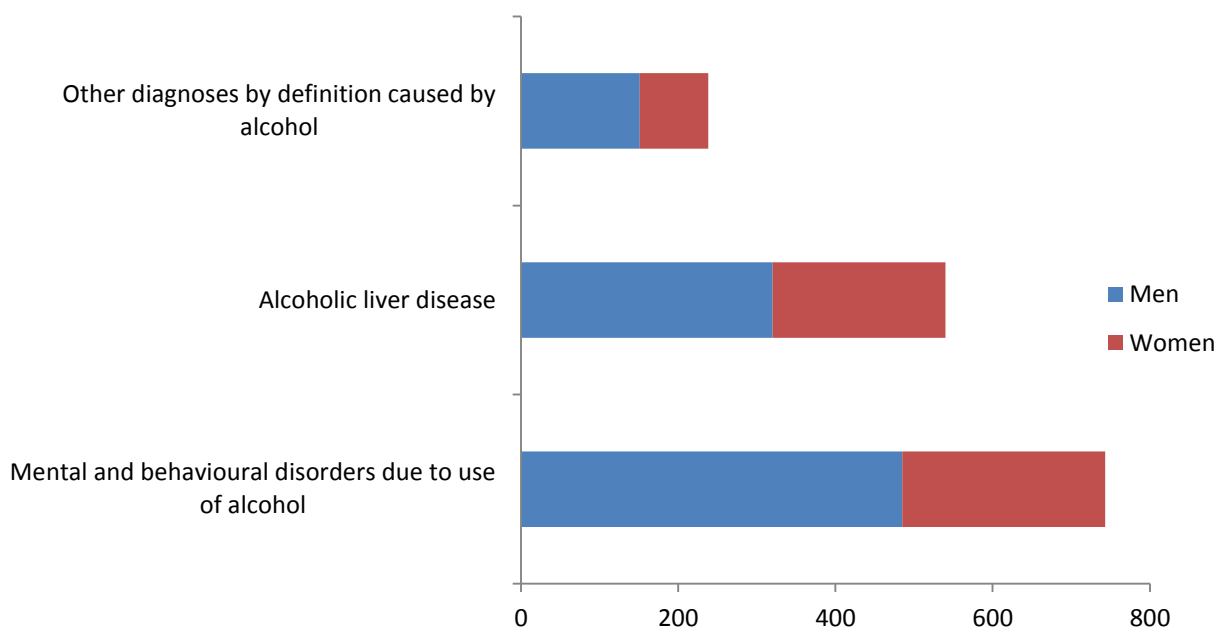
I61	Intracerebral haemorrhage	113	59	54
I62	Other nontraumatic intracranial haemorrhage	54	42	12
I63	Cerebral infarction	1,018	592	426
J10	Influenza due to other identified influenza virus	9	5	4
J11	Influenza with pneumonia, virus not identified	29	13	16
J12	Viral pneumonia, not elsewhere classified	11	4	7
J13	Pneumonia due to Streptococcus pneumonia	3	0	3
J14	Pneumonia due to Haemophilus influenza	5	3	2
J15	Bacterial pneumonia, not elsewhere classified	291	192	99
J16	Pneumonia due to other infectious organisms, not elsewhere classified	2	1	1
J18	Pneumonia, organism unspecified	142	78	64
J20	Acute bronchitis	45	19	26
J21	Acute bronchiolitis	6	4	2
J22	Unspecified acute lower respiratory infection	88	31	57
K292	Alcoholic gastritis	9	7	2
K70	Alcoholic liver disease	28	19	9
K74	Fibrosis and cirrhosis of liver	40	12	28
K85	Acute pancreatitis	45	20	25
K860	Other diseases of pancreas	19	10	9
K861	Other chronic pancreatitis	48	27	21
R780	Finding of alcohol in blood	1	1	0
T510	Toxic effect of alcohol - ethanol	126	72	54
T519	Toxic effect of alcohol - alcohol, unspecified	16	7	9
Z721	Problems related to lifestyle - alcohol use	9	7	2

Source: Norwegian Patient Register

In total, there were 1,540 patient contacts with main diagnoses that by definition are caused by alcohol consumption in 2011, of which 911 were men and 629 were women.

Figure 4-6 shows the most frequently used diagnoses that by definition are caused by alcohol in outpatient clinics in public somatic care in 2011. Diagnoses that were used less than 100 times are grouped together in the category “Other diagnoses by definition caused by alcohol”.

Figure 4-6 Out-patient clinics: Most frequent admissions for diagnoses caused by alcohol, public somatic care, 2011



Source: Oslo Economics/Norwegian Patient Register

The most frequently used diagnoses in outpatient clinics were mental and behavioural disorders due to use of alcohol and alcoholic liver disease. As for in-patient care and day care, the majority of the patient contacts in outpatient clinics were with male patients.

Table 4-4 presents in more detail the number of patient contacts by main diagnosis in outpatient clinics in public somatic care in 2011.

*Table 4-4 Out-patient clinics: Number of patient contacts for alcohol-related conditions by main diagnosis for age group 19+, public somatic care, 2011*

ICD-10	Diagnosis	In total	Male	Female
E244	Alcohol-induced pseudo-Cushing syndrome	3	0	3
F10	Mental and behavioural disorders due to use of alcohol	743	485	258
G312	Degeneration of nervous system due to alcohol	15	12	3
G621	Alcoholic polyneuropathy	37	31	6
I20	Angina pectoris	9,027	5,716	3,311
I21	Acute myocardial infarction	3,973	2,844	1,129
I22	Subsequent myocardial infarction	172	136	36
I23	Certain current complications following acute myocardial infarction	23	18	5
I24	Other acute ischaemic heart diseases	35	22	13
I25	Chronic ischaemic heart disease	31,398	24,215	7,183
I426	Alcoholic cardiomyopathy	8	4	4
I60	Subarachnoid haemorrhage	351	146	205
I61	Intracerebral haemorrhage	439	252	187
I62	Other nontraumatic intracranial haemorrhage	222	144	78
I63	Cerebral infarction	2,532	1,560	972
J10	Influenza due to other identified influenza virus	21	9	12
J11	Influenza with pneumonia, virus not identified	195	94	101
J12	Viral pneumonia, not elsewhere classified	42	18	24
J13	Pneumonia due to Streptococcus pneumonia	43	23	20
J14	Pneumonia due to Haemophilus influenza	21	5	16
J15	Bacterial pneumonia, not elsewhere classified	1,766	906	860
J16	Pneumonia due to other infectious organisms, not elsewhere classified	12	2	10
J18	Pneumonia, organism unspecified	1,078	535	543
J20	Acute bronchitis	293	135	158
J21	Acute bronchiolitis	74	33	41
J22	Unspecified acute lower respiratory infection	367	168	199
K292	Alcoholic gastritis	28	20	8
K70	Alcoholic liver disease	540	320	220
K74	Fibrosis and cirrhosis of liver	1,156	338	818
K85	Acute pancreatitis	361	208	153
K860	Other diseases of pancreas	93	69	24
K861	Other chronic pancreatitis	373	195	178
R780	Finding of alcohol in blood	5	2	3
T510	Toxic effect of alcohol - ethanol	69	34	35
T519	Toxic effect of alcohol - alcohol, unspecified	10	7	3
Z502	Alcohol rehabilitation	25	11	14
Z714	Alcohol abuse counselling and surveillance	4	3	1
Z721	Problems related to lifestyle - alcohol use	34	27	7

Source: Norwegian Patient Register

In out-patient clinics in public somatic care, the number of patient contacts with a main diagnosis that by definition is caused by alcohol was 1,521 in 2011. 956 of these patients were men, and 565 were women.

Combining the three tables gives us a total of 7,285 patient contacts with a main diagnosis by definition caused by alcohol in public somatic care in 2011.

Some individuals are treated by private somatic specialists with a contract with regional health authorities. Patients with diseases that are related to alcohol consumption also seek help within public and private psychiatric care. Tables showing the number of patient contacts by diagnosis can be found in the appendix.

In 2011 there were 43 patient contacts in private somatic specialist care and 18,367 patient contacts in the public and private (with contract with regional health authority) psychiatric care for adults with a main diagnosis by definition caused by alcohol. There were 70 patient contacts by definition caused by alcohol in psychiatric care for children and young people.

In addition to treatment in somatic and psychiatric care, Norwegian health services also offers specialised interdisciplinary treatment for substance abuse (tverrfaglig spesialisert rusbehandling, TSB). It is composed of both health and social care personnel, and includes out-patient services, rehabilitation units and both short and long term in-patient treatments. The total number of alcohol-related patient contacts in specialised interdisciplinary treatment for substance abuse was 74,245. See the appendix for number of patient contacts by diagnosis.

Combining data from all the different health services, the number of patient contacts with main diagnosis by definition caused by alcohol consumption was 100,010 in 2011. The vast majority of these patient contacts were in specialised interdisciplinary treatment for substance abuse.

In addition, an unknown proportion of the other patient contacts with diagnoses such as pneumonia and pancreatitis are also caused by alcohol consumption, as the literature shows that the risk of developing these diseases increases when alcohol is consumed.

The most frequently used diagnosis in 2011 that by definition is caused by alcohol consumption was mental and behavioural disorders due to alcohol use. Men are over-represented in the statistics, indicating that problematic drinking is a greater problem within the male population.

#### 4.1.2 Alcohol increases mortality

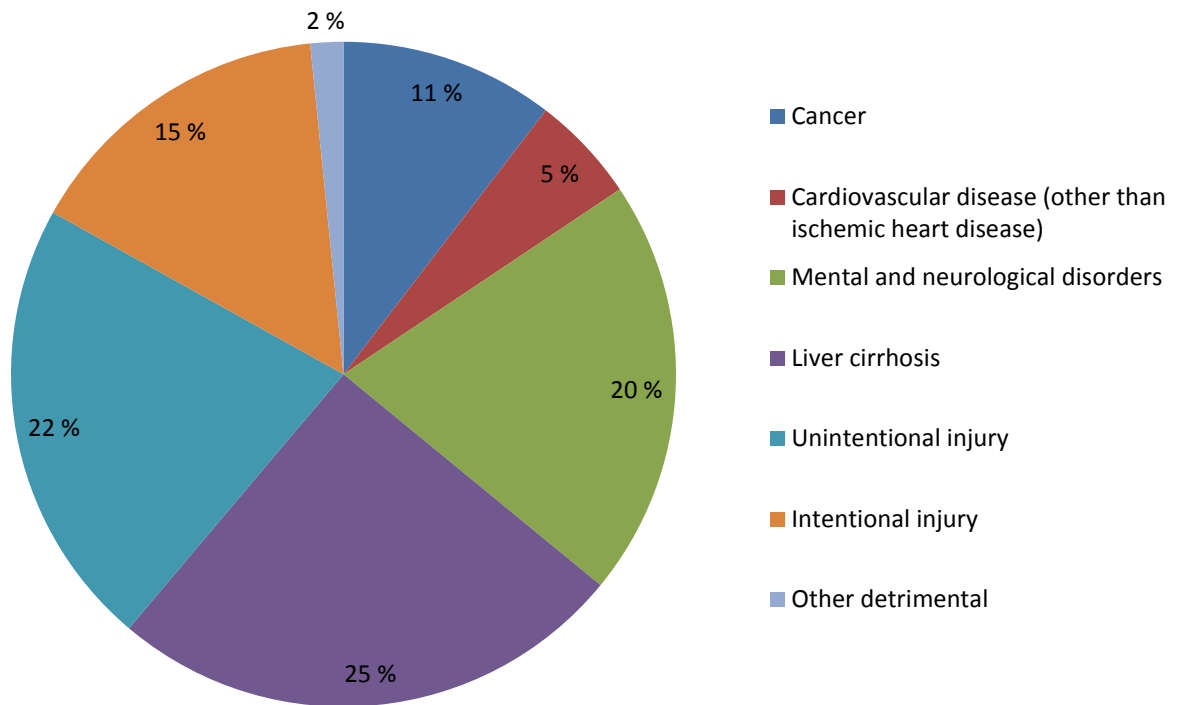
Rehm et al. (2012) estimates the alcohol-attributable mortality, and reports that the proportion of all deaths in the age group 15-64 attributable to alcohol in the Nordic countries is 11.5 per cent for men and 5.9 per cent for women. According to Statistics Norway, a total of 41,393 people died in Norway in 2011. 9,153 of these were in the age group 20-69, which is the closest age group relevant to Rehm et al.'s (2012) estimate where data is publically available. Of these 9,153, 5,715 were men and 3,438 were women. Assuming that the estimate in Rehm et al. (2012) holds for this age group as well, approximately 657 men and 202 women died as a result of alcohol consumption.

As with morbidity, there are many diagnoses possibly associated with alcohol and mortality. As for morbidity, some diagnoses are undoubtedly caused by alcohol, while others are multifactorial.

The figures and table below indicate the alcohol-attributable deaths by broad disease categories for people between 15 and 64 years of age living in the Nordic countries in 2004.

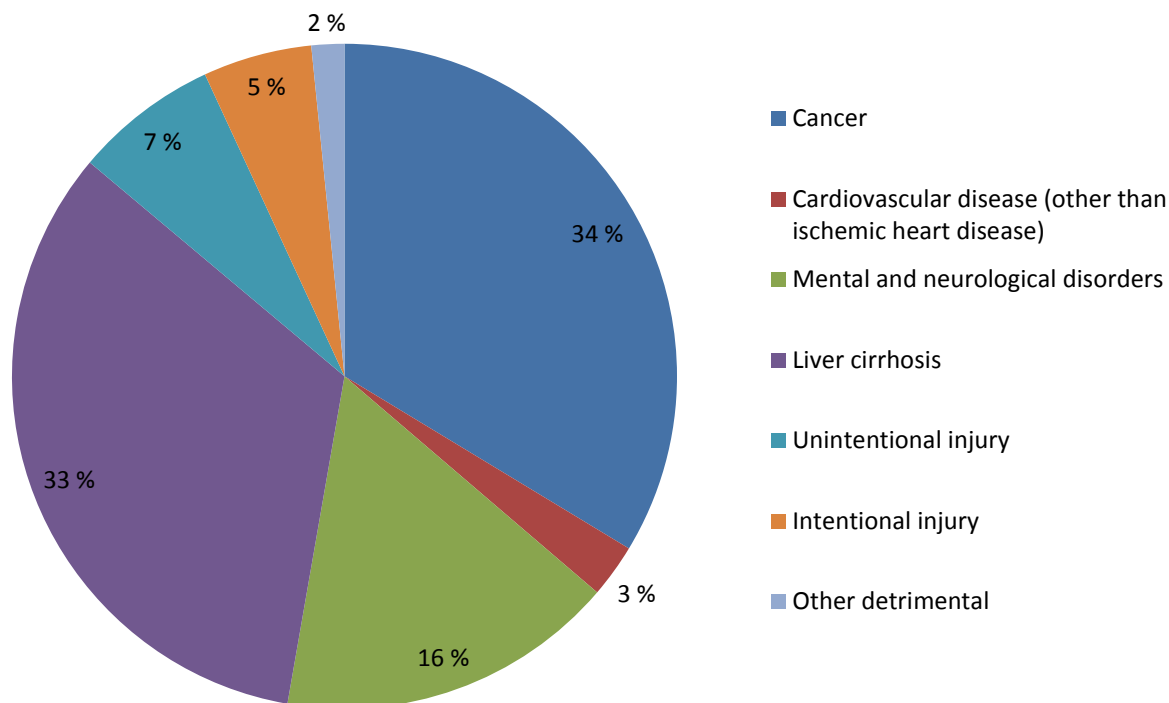


Figure 4-7 Proportion of alcohol-attributable deaths caused by different diseases, for men aged 15-64 living in the Nordic countries, 2004



Source: Oslo Economics/Rehm et al. (2012)

Figure 4-8 Proportion of alcohol-attributable deaths caused by different diseases, for women aged 15-64 living in the Nordic countries, 2004



Source: Oslo Economics/Rehm et al. (2012)

Table 4-5 Proportion of alcohol-attributable deaths according to diagnosis, for people aged 15-64 living in the Nordic countries, 2004

Disease	Men	Women
Cancer	10.4	33.7
Cardiovascular disease (other than ischemic heart disease)	5.2	2.6
Mental and neurological disorders	20.3	16.5
Liver cirrhosis	25.2	33.4
Unintentional injury	21.9	7.0
Intentional injury	15.3	5.3
Other detrimental	1.6	1.6
Total detrimental	100.0	100.0

Source: Rehm and Shield (2012)

Alcohol-related liver cirrhosis was the most common alcohol-related cause of death for men, whilst cancer from alcohol use was the most common cause of death for women. Liver cirrhosis followed closely after cancer as a common cause of death for women. We also see

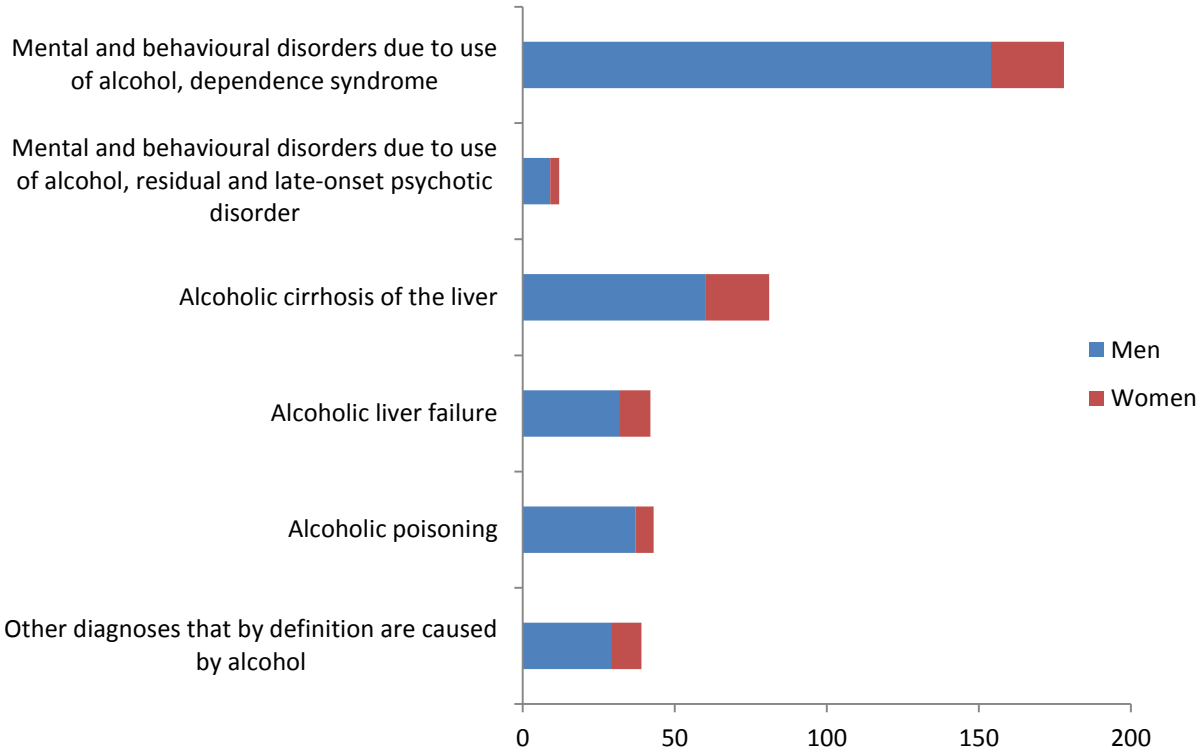
that men are overrepresented on the statistics for deaths caused by both intentional and unintentional injury from alcohol use.

Another important measure involving mortality is Potential Years of Life Lost (PYLL). PYLL is a measure of premature mortality and tries to estimate the length of time a person would have lived if he or she had not died early. PYLL gives more weight to deaths that occur among younger people than what is the case with number of deaths.

Rehm et al. (2012) estimates that the proportion of all PYLLs that are alcohol attributable is equal to 13.3 per cent for men and 6.1 per cent for women in the age group 15-64 living in the Nordic countries. The proportion of all PYLLs that are alcohol-attributable is thus larger than the proportion of mortality that is caused by alcohol for both men and women. This means that people dying from alcohol are younger than people who die of other causes.

In the following, we present statistics on the number of deaths undoubtedly or possibly caused by alcohol in Norway in 2011. Figure 4-9 shows the most common causes of death that by definition are caused by alcohol. All diagnoses that caused less than 10 deaths are grouped together in the category “Other diagnoses that by definition are caused by alcohol”.

*Figure 4-9 Most common causes of death that by definition are caused by alcohol, 2011*



Source: Statistics Norway/RusStat

The most frequent alcohol-attributable cause of death among both men and women in 2011 was dependence syndrome (mental and behavioural disorders due to use of alcohol). 45 per cent of all the alcohol-attributable deaths had this diagnosis. There are more men than women dying from alcohol.

Table 4-6 and Table 4-7 present in more detail the number of deaths caused by alcohol. Both tables are based on data from Statistics Norway. Table 4-6 only includes diagnoses that by definition are caused by alcohol consumption. Table 4-7 includes diagnoses for diseases that can be caused by alcohol consumption, but that are multifactorial. Individuals are more likely to get injured or to develop and die from several diseases when they consume alcohol. However, we do not know much about how many of these deaths that actually are caused by alcohol consumption. Table 4-7 is thus only an indication of possible effects on mortality from alcohol consumption.

*Table 4-6 Number of deaths attributable to alcohol, by main diagnosis and sex, 2011<sup>17</sup>*

ICD 10	Underlying cause of death	In total	Male	Female
F10.0	Mental and behavioural disorders due to use of alcohol. Acute intoxication	0	0	0
F10.2	Mental and behavioural disorders due to use of alcohol, dependence syndrome	178	154	24
F10.4	Mental and behavioural disorders due to use of alcohol, withdrawal state with delirium	1	0	1
F10.7	Mental and behavioural disorders due to use of alcohol, residual and late-onset psychotic disorder	12	9	3
G31.2	Degeneration of nervous system due to alcohol	3	2	1
G62.1	Alcoholic polyneuropathy	0	0	0
I42.6	Alcoholic cardiomyopathy	6	5	1
K29.2	Alcoholic gastritis	1	0	1
K70.0	Alcoholic fatty liver	9	7	2
K70.1	Alcoholic hepatitis	3	2	1
K70.2	Alcoholic fibrosis and sclerosis of the liver	2	1	1
K70.3	Alcoholic cirrhosis of the liver	81	60	21
K70.4	Alcoholic liver failure	42	32	10
K70.9	Alcoholic liver disease	6	6	0
K86.0	Alcohol-related chronic pancreatitis	6	4	2
X45	Alcoholic poisoning	43	37	6
X65	Suicide with alcohol	2	2	0
	In total	395	321	74
	All deaths	41,304	20,029	21,275

Source: Statistics Norway/RusStat

Table 4-6 shows that a total of 395 individuals died from injuries and diseases that by definition were caused by alcohol consumption in Norway in 2011. Of these 395 individuals, 321 were men, and only 74 were women.

Deaths caused by traffic accidents and other injuries involving alcohol, are not included in Table 4-6. As with non-fatal alcohol-related injuries and accidents in Chapter 4.1.1, influence of alcohol is usually not stated as a secondary diagnosis even though physicians in principle should do so. Table 4-6 only includes deaths by main diagnosis. This means that it is likely to have been more alcohol-attributable deaths in 2011 than is indicated by Table 4-6. It is however difficult to account for these deaths when alcohol influence is not part of the main diagnosis.

Table 4-7 accounts for the number of motor vehicle accidents and other types of injuries in 2011 that might be alcohol-related. It also presents data on the number of deaths caused by

<sup>17</sup> The causes of death that are included in this table are mainly due to high consumption of alcohol over a long period of time. These deaths constitute only a fraction of all deaths that fully or in part are caused by alcohol.

diseases that alcohol consumers have a higher risk of developing. Not all of the deaths presented in the table are alcohol-related.

*Table 4-7 Number of deaths by diagnosis and sex, 2011*

ICD-10	Diagnosis	In total	Male	Female
I20-I25	Ischemic heart disease	4,967	2,635	2,332
I63-I66	Ischemic stroke	1,975	744	1,231
I60-I62	Hemorrhagic and other non-ischemic stroke	689	335	354
K70, K74	Cirrhosis of the liver	189	133	56
K85, K86.1	Acute and chronic pancreatitis	47	21	26
J10-J18, J20-J22	Lower respiratory infections	1,612	733	879
V0n, V1n, V2s, V2t, V4n, V5n, V6n, V7n, V9s, V9t, V98, V99	Motor vehicle accidents	157	106	51
X40-X49	Poisonings	294	229	65
W00-W019	Falls	420	210	210
X00-X09	Fires	36	14	22
W65-W74	Drowning	55	45	10
W20-W64, W75-W99, X10-X39, X50-X59, Y40-Y86, Y88, Y89	Other Unintentional injuries	929	423	506
X60-X84, Y87.0	Self-inflicted injuries	598	434	164
X85-Y09, Y87.1	Homicide	114	62	52
	Total	12,082	6,124	5,958
	All deaths	41,304	20,029	21,275

Source: Statistics Norway

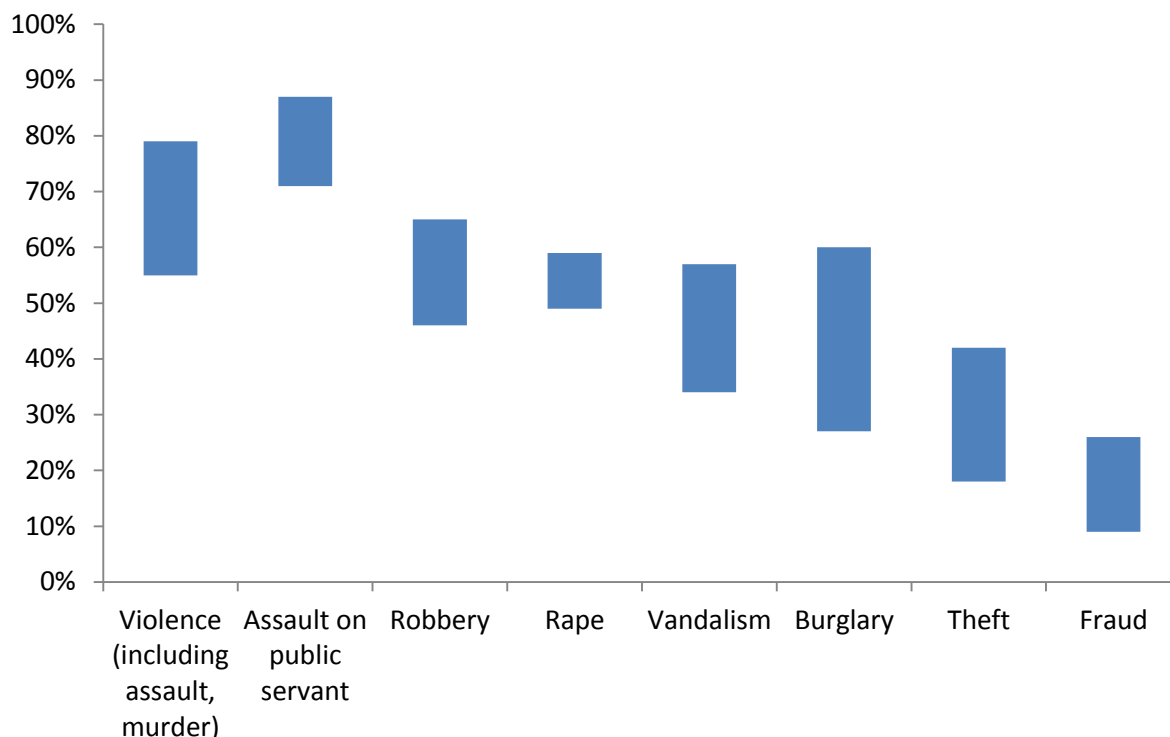
In 2011 a total of 12,082 individuals died of causes that may be alcohol-related.

## 4.2 The proportion of perpetrators who are under the influence of alcohol is high

Several international studies have found a positive correlation between alcohol abuse and delinquency. At the same time, criminal offences are costly for society. Up until 1981, the Norwegian police registered whether perpetrators were under the influence of alcohol or not.

Figure 4-10 and Table 4-8 show the proportion of perpetrators that was registered as being under the influence of alcohol at the time of the criminal offence. In the figure the intervals are indicated by the blue bars. For example, the proportion for violence is between 55 and 79 per cent.

Figure 4-10 Proportion of perpetrators being under the influence of alcohol, 1981



Source: Oslo Economics/Gjelsvik (2004)

For most types of delinquency, the proportion of the perpetrators being under the influence of alcohol is fairly high.

Table 4-8 Proportion of perpetrators being under the influence of alcohol, 1981

Type of delinquency	Proportion of perpetrators being under the influence of alcohol
Violence (including assault, murder)	55 - 79 %
Assault on public servant	71 - 87 %
Robbery	46 - 65 %
Rape	49 - 59 %
Vandalism	34 - 57 %
Burglary	27 - 60 %
Theft	18 - 42 %
Fraud	9 - 26 %

Source: Gjelsvik (2004)

A positive correlation between alcohol and delinquency does however not mean that there is causality between drinking alcohol and breaking the law. The perpetrators who were under the influence of alcohol did not necessarily break the law because they had been drinking. There might very well be a selection problem, where perpetrators under the influence are easier to reveal and arrest than perpetrators that are sober, or where perpetrators are a

group of people who for other reasons engage in a number of risky and socially disapproved activities - including heavy drinking.

Grönqvist and Niknami (2011) does however show that an increased availability of alcohol increases crime. Swedish state monopoly outlets in some counties were for a period allowed to keep open on Saturdays, and the article finds that this led to increased sales of alcohol and also increased crime.

There are costs related to alcohol-related crime. These costs are associated with

- Prevention of criminal offences, such as insurance, alarms, precautions
- Consequences of crime, such as stolen property, lost productivity, costs for health care sector, early deaths, emotional and physical harm to victims
- Response to criminal offences, such as imprisonment, legal costs.

Gjelsvik (2004) estimates the maximum amount of these costs to be around NOK 2,900 million. We have not estimated this cost, and will in the following use Gjelsvik's estimate.

### **4.3 Loss of productivity**

Alcohol consumption may have a negative impact on work force participation and productivity. It is well documented that it increases work absenteeism and the risk of accidents at work, and that it decreases the productivity and the quality of the work (Grimsmo and Rossow, 1997; US, 1970). In addition, alcohol may have negative impact on the interpersonal relationship at the work place.

It is normal to estimate the effect of alcohol consumption on productivity through increased work absenteeism and unemployment, reduced work quality and reduced income caused by lost life years.

#### **4.3.1 Alcohol increases work absenteeism**

As alcohol consumption increases the morbidity, the work absenteeism is higher than it would be if people did not consume alcohol. The lost working days could have been used to produce goods and services, and this loss in production is a cost for society.<sup>18</sup> Several

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<sup>18</sup> If the alcohol consumer has consciously chosen the risk because he obtains utility and enjoyment from consuming alcohol, the lost productivity is not a cost, but a trade-off.



international studies document a positive relationship between alcohol consumption and work absenteeism.

Grimsmo and Rossow (1997) report that 14-17 per cent of the short-term work absenteeism (1-3 days) and about 2 per cent of the long-term work absenteeism is alcohol-related.

#### 4.3.2 Positive relationship between unemployment and alcohol

There is also a positive relationship between alcohol and unemployment. Alcohol can in some cases induce unemployment, but unemployment also seems to cause increased alcohol consumption. The causality may in other words be bi-directional, and it is thus difficult to estimate the share of unemployment caused by alcohol consumption.

#### 4.3.3 Alcohol induces lower quality of work

Individuals with alcohol problems may have lower productivity when at work because of general tiredness, hangovers, mood swings, or more serious somatic or mental problems. In some cases it may also be a direct effect of being under the influence of alcohol at work. This production loss represents a cost for society.

US (1970) finds that alcohol abusers are 25 per cent less productive than non-abusers.

#### 4.3.4 Lost life years because of alcohol

Lost life years because of early deaths represent a loss of productivity in the same way as work absenteeism and unemployment does. As long as the people who die early are of working age, society would have gained from preventing these deaths in form of higher production of goods and services.

In Chapter 4.1.2, we found that 395 deaths were by definition caused by alcohol in 2011.

### 4.4 Negative effects on family

Alcohol problems in a family might have several negative consequences. For children, growing up with one or two alcohol dependent parents can be very tough and is likely to create both long- and short-term problems. According to Gjelsvik (2004), between 160,000 and 230,000 children in Norway are affected by their parents' alcohol use for longer or shorter time periods. This is equivalent to 1 out of 5 children growing up in a family where alcohol is a problem.

Gjelsvik (2004) estimates the total costs for social services for children to be NOK 371 million. This estimate is based on the finding that 3,285 children were in contact with social

services for children in 2001 because of problems with alcohol-, pharmaceutical- or drug abuse in the family. This estimate is in other words too high.

Furthermore, studies have found that in 25 to 33 per cent of all cases of divorce in Norway, alcohol abuse is given as the main or one in several reasons for divorce (Fekjær, 1987).

There are several consequences of a divorce that is costly for society, for example psychiatric help, work absenteeism and legal disputes.

## 4.5 Total costs

The costs associated with the negative consequences of alcohol are many. Some of these costs, such as the costs for treatment in the health sector, are possible to estimate, but for other costs, such as the anxiety and discomfort of relatives and friends of people who abuse alcohol, it is more difficult and sometimes impossible to give a reasonable estimate. In the following we try to estimate the main quantifiable impacts, including costs for GP services, somatic hospitals, psychiatric care, costs associated with preventive measures and the loss of production caused by work absenteeism and early retirement/disabled benefits. Note that some of these cost estimates are highly uncertain. We also summarise the main non-quantifiable impacts.

### *GP services*

In 2011, there were 79,187 patient contacts in the GP services registered with the ICPC-diagnosis chronic alcohol abuse, P15, and 10,503 patient contacts registered with the ICPC-diagnosis acute alcohol abuse, P16. According to HELFO, the total cost for these patient contacts was NOK 28 million.

### *Somatic care*

The dataset from the Norwegian Patient Register (NPR) showing activity in public somatic care contains information about the diagnosis-related group (DRG) for each patient contact. We have selected the ICD-10 diagnoses that undoubtedly are alcohol-related<sup>19</sup>, and found the DRG for each patient contact. The DRGs are assigned weights by the health authorities according to how much it on average costs to treat the diagnoses (Helsedirektoratet, 2010). In addition, we have selected the ICD-10 diagnoses I61 (intracerebral haemorrhage), I62 (other nontraumatic intracranial haemorrhage) and I63 (cerebral infarction), which, according to a recent report from the Norwegian Knowledge Centre for the Health Services,

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<sup>19</sup> ICD-10 diagnoses: E244, F10, G312, G621, G721, I426, K292, K70, R780, T510, T519, Z502, Z714, Z721, J11, J12, J13, J14, J15, J16, J17, J18, K85

have a higher risk of occurring when alcohol intake is high and equal to 100 g per day. Unfortunately, there are limited data on the proportion of the Norwegian population who consume 100 g alcohol or more per day. Conservatively, we have used the proportion of the adult Norwegian population with an alcohol dependency problem (6 per cent) as a proxy. Using the assigned DRG-weights and the population attributable risk, we found the alcohol-related cost of the patient contacts with diagnosis I61, I62 or I63. Based on this, we have calculated the total alcohol-related cost in public somatic care in 2011, and found it to be NOK 1,757 million.

In addition to the patient contacts in public somatic care, Chapter 4.1.2 showed that private somatic specialists with a contract with regional health authorities also treat patients with alcohol-related problems. Only considering the diagnoses that undoubtedly are alcohol-related, and the alcohol attributable share of patient contacts with diagnoses I61, I62 and I63, there were 352 patient contacts in private somatic hospitals. The assumed cost per consultation with a somatic specialist is NOK 382.<sup>20</sup> The total alcohol-related cost in private somatic hospitals in 2011 was thus NOK 134,472.

### *Psychiatric care*

In the public psychiatric care for adults, there were 17,040 patient contacts that undoubtedly were alcohol-related. In addition, there were 3 alcohol attributable patient contacts with main diagnosis I61, I62 or I63. The dataset from NPR does not contain information on the length of the treatment. This makes it difficult to estimate the cost. According to Helsedirektoratet (2012), the average cost per discharge from in-patient care was NOK 240,706. The average cost per consultation at an out-patient clinic is assumed to be NOK 905.<sup>21</sup> Helsedirektoratet (2012) also gives the total number of discharges from in-patient care and the number of consultations at out-patient clinics in 2011. The numbers are 52,763 and 1,239,625 respectively. A weighted average cost for a patient contact is thus NOK 10,695. The total cost for alcohol-related patient contacts in the public psychiatric care for adults was thus NOK 182 million.

In the private psychiatric specialist care with contract with regional health authorities, there were 1,585 alcohol-related patient contacts. The assumed cost per consultation was NOK

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<sup>20</sup> Tariff 3ad and 3bd in «Normaltariff for privat spesialistpraksis 2011-2012» published by the Norwegian Medical Association.

<sup>21</sup> Calculated from reimbursement fees that are supposed to cover 40 per cent of the total cost, tariff P10 "Forskrift om endring i forskrift om godtgjørelse av utgifter til helsehjelp som utføres poliklinisk ved statlige helseinstitusjoner som mottar driftstilskudd fra regionale helseforetak", <http://www.lovdatabase.no/ltavd1/filer/sf-20111219-1430.html>

524 in 2011. The total cost for alcohol-related consultations was thus NOK 830,676. This number is small compared to the cost in the public psychiatric care for adults.

In the psychiatric care for children and young people there were 70 patient contacts that undoubtedly were alcohol-related. All of them had the ICD-10 diagnosis F10. A first consultation at an out-patient clinic for children and young people is assumed to cost NOK 2588.<sup>22</sup> Assuming that this is the cost for all the 70 patient contacts with diagnosis F10, the alcohol-related cost in psychiatric care for children and young people was NOK 181,160. The total alcohol-related cost is likely to be higher than this, as it is only the diagnosis of the child that is registered. The cause behind anxiety and other problems can be alcohol problems in the family, but alcohol would then not be part of the child's diagnosis.

### *Interdisciplinary treatment for substance abuse (TSB)*

The total costs in specialised interdisciplinary treatment for substance abuse (TSB) in 2011 amounted to NOK 3,565 million (Helsedirektoratet, 2012). This section of the health services deals with health problems related to alcohol, narcotics and other substances. It is challenging to estimate the proportion of the total costs that is related to alcohol problems because the diagnoses can be uncertain and because several of the patients are abusing several substances. In 2010, 26 per cent of the patients in out-patient clinics and 38 per cent of the patients in in-patient care had the alcohol-related diagnosis mental and behavioural disorder due to use of alcohol (F10) (Helsedirektoratet, 2011). If we assume that 32 per cent of the costs in TSB are alcohol-related, the total costs in TSB due to alcohol were NOK 1,141 million in 2011.

### *Pharmaceuticals*

We searched the Norwegian Prescription Register for the two drugs that are offered exclusively for alcohol problems in the Norwegian (disulfiram and acamprosat). A total of 5,084 patients redeemed a prescription for these drugs at a total cost of NOK 3.56 million inclusive of VAT.

### *Blue Cross*

The organisation Blue Cross has a variety of services for people with alcohol problems. Its annual budget is NOK 815 million.

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<sup>22</sup> Calculated from reimbursement fees that are supposed to cover 40 per cent of the total cost, tariff P20 "Forskrift om endring i forskrift om godtgjørelse av utgifter til helsehjelp som utføres poliklinisk ved statlige helseinstitusjoner som mottar driftstilskudd fra regionale helseforetak", <http://www.lovdatab.no/ltavd1/filer/sf-20111219-1430.html>

### *Social services and preventive measures*

Statistics Norway report that NOK 4,502 million were granted by the municipalities to social services (sosialhjelp in Norwegian) in 2011. If we assume that 10 per cent of this represented cash support for people with alcohol problems, the alcohol-related cost for social services was NOK 450 million.

AKAN (Arbeidslivets kompetansesenter for rus- og avhengighetsproblematikk - Worklife competence centre for addiction in English) is a service centre that supports AKAN activities in numerous smaller and bigger firms. The idea is to assist employees with problematic drinking behaviour. The activity is done on collaboration with nurses and doctors and aims at avoiding job absenteeism and failure. The AKAN centre has annual costs of NOK 18 million. Assuming that 10,000 firms have AKAN activities each at a cost of NOK 10,000, the total cost is NOK 100 million. This estimate is likely an underestimate. The total cost is NOK 118 million.

The Salvation Army in Norway spent NOK 266 million in 2011 on food, shelter, and other types of assistance to people with addiction problems. If we assume that 50 per cent of these costs were related to alcohol problems, the alcohol-related cost was NOK 133 million.

We also approached the Norwegian Teetotalism Association (Norges Totalavholdsselskap in Norwegian) which reported an annual budget of NOK 4.9 million. Two other similar associations (Hvite Bånd and IOGT) did not respond to our requests, but their budgets are presumably modest.

SIRUS (Statens institutt for rusmiddelforskning - Norwegian Institute for Alcohol and Drug Research) had a budget of NOK 43 million. If we assume that 50 per cent of SIRUS' budget is related to alcohol, the alcohol-related cost was NOK 21.5 million.

### *Traffic accidents*

Statistics Norway reports that 157 people were killed in traffic accidents in 2011. Furthermore, 68 people suffered very serious injuries, 650 serious injuries and 7,201 mild injuries. Statistics Norway report that approximately 20 per cent of accidents are related to drugs and alcohol. Assuming that 15 per cent of the total costs are alcohol related, and using the cost per accident estimated by TØI (Transportøkonomisk institutt - The Institute of Transport Economics), we find that the alcohol-related cost of traffic accidents was NOK 2,402.4 million. This cost includes health care costs and the cost of lost life years.

### *Fires and insurance payments*

The Norwegian Fire Protection Association report that insurance payments after fires amounted to NOK 5,560 million in 2011. In a recent study of fires with fatal outcomes, alcohol was involved in approximately 50 per cent of the cases. This is however not equivalent to alcohol being the underlying cause of the fire in 50 per cent of the cases. If a drunk person turns on an electric oven to prepare food, then falls asleep and the hot oven causes a fire, there is a clear causal link between alcohol and the fire. If a technical fault in the electrical system causes a fire and a drunk person dies in the fire alcohol is not the cause of the fire, but possibly of the fatality. In other words, even though alcohol was involved in approximately half of all fires with fatal outcomes, it may very well not be the underlying cause of the fire in all of these cases. We have thus conservatively assumed that alcohol was the underlying cause in only 25 per cent of the fires with fatal outcomes. Alcohol thus caused fire damages of NOK 1,390 million. It should be noted that insurance payments may be reduced or totally denied if the customer is wholly or in part responsible for the damage.

### *Loss of productivity due to short-term sick leave*

In Norway, employees are paid their full salary for up to 365 days of sickness. The employer pays the first 16 days, and the government pays for any additional days. Unfortunately, there is no data available on sickness payments from the employer. However, in 2011, on average 6.8 per cent of employees were absent from work because of sickness, 1 per cent self-reported and 5.8 per cent physician reported (SSB). We assume that the self-reported absence represent half of all absence during the first 16 days. This means that the sickness absence of 6.8 per cent is represented by 2 per cent paid by the employer and 4.8 per cent by the government.

In 2011, the government paid NOK 31,000 million in sickness benefits. Based on the assumptions above, the employers are additionally paying  $(\text{NOK } 31,000 \text{ million} * 0.048 / 0.068) = \text{NOK } 43,900 \text{ million}$ .

Swedish data indicate that increasing alcohol consumption from low to medium or high risk drinking levels increase the risk of sickness absence by a factor of 4. If we assume that 5 per cent of the population has this risk level, the sickness payments related to alcohol would represent  $(\text{NOK } 43,900 \text{ million} * 0.05 * 3) = \text{NOK } 6,588 \text{ million}$ . We used a factor of 3 because those with high alcohol consumption may be absent for other reasons than high alcohol intake.

We assume that the productivity losses are 40 per cent greater than the sickness payments. This means that the value of lost productivity due to short-term work-absenteeism was approximately NOK 9,200 million in 2011.

#### *Loss of productivity due to long-term work absenteeism*

Individuals who are absent from work for more than a year receives long-term benefits from the government, either in the form of work assessment allowance (arbeidsavklaringspenger in Norwegian) or disability pensions (uførepensjon in Norwegian). Disability pensions are given to individuals who are of working age, but who are permanently unable to work. In 2011, the government granted NOK 56.1 billion to disability pensions (Statsbudsjettet 2011). According to NAV, the proportion of individuals receiving disability pensions that had the diagnosis mental and behavioural disorders due to substance abuse was 7.1 per cent. If we assume that 25 per cent of these individuals had mental and behavioural disorders because of alcohol abuse,  $(\text{NOK } 56,100 \text{ million} * 0.071 * 0.25) = \text{NOK } 995.8 \text{ million}$  were given in disability pensions to people with alcohol-related problems.

Work assessment allowance is given to individuals who have a reduced ability to work because of illness, injury or disability, whilst undergoing treatment or participating in activities that increase the probability of them returning to or staying in the labour market. In 2011, the government granted NOK 37.7 billion to work assessment allowance (Statsbudsjettet 2011). Assuming that the proportion of individuals receiving work assessment allowance that had the diagnosis mental and behavioural disorders due to alcohol abuse is the same as for disability pensions,  $(\text{NOK } 37,700 \text{ million} * 0.071 * 0.25) = \text{NOK } 669.2 \text{ million}$  were given in work assessment allowance to people with alcohol-related problems.

The proportion of people receiving disability pensions and work assessment allowance that have alcohol-related problems are probably higher than we indicate here. This is mainly caused by the stigma around alcohol abuse and the fact that many individuals are given a different non-alcohol-related diagnosis even though alcohol might be the underlying cause.

Assuming that the loss of productivity was 40 per cent higher than the long-term work absenteeism payments, the value of the loss in productivity due to long-term work absenteeism was approximately NOK 2,331 million in 2011.

Table 4-9 summarises the costs associated with use and abuse of alcohol. According to our estimate, the total societal cost amounted to at least NOK 22.3 billion in 2011. Some of these cost elements are however highly uncertain as they are difficult to estimate. The societal cost is likely to be even higher than our estimates.

### *Loss of productivity due to unemployment*

According to Statistics Norway, 86,000 people were unemployed in 2011.<sup>23</sup> The proportion of these individuals being unemployed because of alcohol problems is unknown, and as discussed in Chapter 4.3.2, the causality between unemployment and alcohol might be bi-directional. In the Norwegian adult population as a whole, 6 per cent have a dependency problem and 11 per cent have a problematic consumption level. If we assume that the proportion of people with a problematic alcohol consumption and a dependency problem is the same for the unemployed as for the Norwegian population as a whole, between 5,160 and 9,460 unemployed people had an alcohol problem in 2011. Assuming that alcohol is the underlying cause of unemployment in 50 percent of the cases, between 2,580 and 4,730 individuals were unemployed because of alcohol. This estimate is highly uncertain, but indicates that the societal cost of alcohol-caused unemployment was between NOK 1,636-3,000 million in 2011. This estimate is based on the assumption that the average value of one year lost productivity in 2011 was approximately NOK 634,200 per year (average salary of NOK 453,000 plus social cost of 40 per cent)<sup>24</sup>. Due to the degree of uncertainty, this estimate is not included in our total societal cost estimate.

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<sup>23</sup><https://www.ssb.no/statistikbanken/selectvarval/Define.asp?subjectcode=&ProductId=&MainTable=AKUAarNY&nvl=&PLanguage=0&nyTmpVar=true&CMSSubjectArea=arbeid-og-lonn&KortNavnWeb=aku&StatVariant=&checked=true>

<sup>24</sup><https://www.ssb.no/statistikbanken/selectvarval/Define.asp?subjectcode=&ProductId=&MainTable=LonnInNarEndrAlle&nvl=&PLanguage=0&nyTmpVar=true&CMSSubjectArea=arbeid-og-lonn&KortNavnWeb=lonnansatt&StatVariant=&checked=true>



Table 4-9 Quantifiable effects

Type	Diagnostic criteria	Number of services	Total cost (NOK mill)
<b>Health care costs</b>			
GP services	ICPC: P15, P16	89,489	28.0
Private specialists (somatic)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	352	0.1
Private specialists (psychiatric)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	1,585	0.8
Somatic hospital care	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	43,523	1,756.5
Interdisciplinary services substance abuse	Assumed 32 % of services are alcohol related		1,141.0
Psychiatric care (adults)	ICD10: E244, F10, G312, G621, G721, I426, J11-J18, K292, K70, K85, R780, T510, T519, Z502, Z714, Z721. Alcohol-attributable proportion of I61-I63.	17,043	182.3
Psychiatric care (children and young people)	ICD10: F10	70	0.2
Pharmaceuticals	Pharmaceuticals for alcohol problems	5,084	3.6
Blue Cross services	Assumed that all services are alcohol-related		815.0
<b>Other costs</b>			
Salvation Army services	Assuming that 50 % of services are alcohol-related		133.0
AKAN	Central management: NOK 18 million		118.0
SIRUS	Assuming that 50 % is alcohol-related.		21.5
Delinquency and crime <sup>25</sup>			2,900.0
Traffic accidents (health care, lost life years, etc.)			2,402.4
Fires	Insurance payments (2011), assuming that 25 % is alcohol-related.		1,390.0
Productivity losses caused by short term sick leave			9,200.0
Productivity losses due to long term work absenteeism			2,331.0
<b>Total</b>			<b>22,423.4</b>

Source: Oslo Economics/Gjelsvik (2004)

In addition, there are several non-quantifiable effects. These effects are impossible or very difficult to estimate. They are nonetheless present, and it is valuable to mention and indicate the sign of such effects. See Table 4-10 for details.

*Table 4-10 Non-quantifiable effects*

Non-quantifiable effects
<b>Positive</b>
Enjoyment/utility from drinking alcohol
Enjoyment/utility from seeing others being happy
<b>Negative</b>
Loss of life years
<i>Value of life years</i>
Reduced quality of life from disease or injury
Anxiety and discomfort
<i>Patient</i>
<i>Relatives</i>
<i>Others</i>
Concern and anxiety about crime
<i>Relatives</i>
<i>Others (workplace, etc.)</i>

Source: Oslo Economics

As the table indicates, the non-quantifiable effects are both positive and negative. The positive effects include enjoyment from consuming alcohol and from seeing others being happy. These effects are the ones experienced by the majority of the population who consume alcohol in a non-harmful way.

The negative effects include the value of lost life years; the experienced reduced quality of life as a result from disease or injury; anxiety and discomfort for individuals with drinking problems, and the relatives and friends of these individuals; and concern and anxiety about crime.

An important division of problems and costs is between externalities and costs as a result of self-control problems. According to economic theory, people who consume alcohol in a non-problematic way should be taxed if their drinking has negative consequences for others. Such an externality can for example be noise that disturbs the sleep of others. By taxing the alcohol consumer, he or she is paying for the right to exert a negative externality, the person who experiences the externality is being compensated, and the externality is thus internalised.

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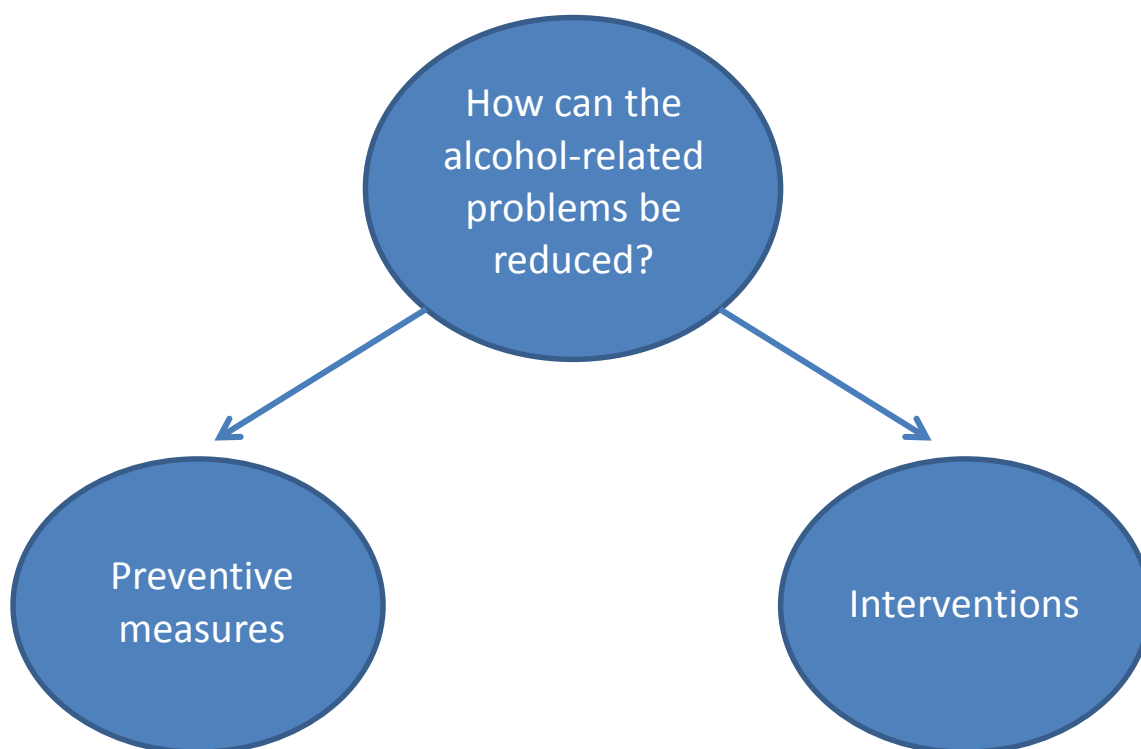
<sup>25</sup> Estimate from Gjelsvik (2004).

The problem with alcohol and other addictive substances is that some people have problems controlling their own consumption level. For these people, an increase in price as an attempt to internalise an externality would not affect these individuals' decision on how much to consume. Because of the dependency problem, an increased price would not lead to a lower consumption level for the dependent person, even though he or she would have wanted it to.

## 5 Preventive measures and intervention in the health care sector

As discussed in Chapters 1 and 3, alcohol is a natural and unproblematic part of most Norwegians' life, but for some, drinking creates several problems, see Chapter 4. These problems include health issues, social problems related to work and family, and delinquency. In this chapter, we discuss how the problems related to alcohol consumption can be reduced without depriving the majority of the population of their traditions and pleasures of alcohol.

*Figure 5-1 How can the alcohol-related problems be reduced?*



Source: Oslo Economics

Figure 5-1 illustrates two possible ways to reduce the alcohol-related problems; preventive measures and interventions in the health sector. Preventive measures are aimed at many groups of the Norwegian population, whilst interventions in the health care sector is aimed at people whose alcohol consumption already is problematic or at people who are affected by someone else's drinking.

### 5.1 Preventive measure are meant to reduce the total alcohol consumption level

In Norway, preventive measures are aimed at the population as a whole and the goal is to reduce the total level of alcohol consumption. There is a well-documented relationship

between the total amount of consumed alcohol and the level of alcohol-related problems (Ot.prp. nr. 86, 2003-2004). In the following, we discuss the different types of preventive measures

### 5.1.1 Price/tax restrictions

The thought behind price/tax restrictions on alcohol is that as the price increases the demand decreases. This is based on basic economic theory. In Norway, the level of the tax depends on the alcohol contents in the beverage. The reasoning behind this is that alcoholic beverages with a higher percentage of alcohol are more detrimental than beverages with a lower percentage of alcohol.

### 5.1.2 Age-based availability restrictions

In Norway, the minimum legal drinking age for alcoholic beverages with less than 22 per cent alcohol by volume is 18, and 20 for alcoholic beverages with more than 22 per cent alcohol by volume.

### 5.1.3 Temporal availability restrictions

It is only allowed to retail alcohol at certain times of the day, and it is not allowed to retail alcohol at certain days of the year, including Sundays and public holidays.

### 5.1.4 Spatial availability restrictions

As mentioned earlier, alcoholic beverages with alcohol by volume percentage above 4.75 is only sold at Vinmonopolet. This is a state-owned monopoly, and there are certain rules for where they are allowed to open retail outlets.

### 5.1.5 Informational campaigns

The government creates informational campaigns aimed at reducing the alcohol consumption level. Such campaigns are typically created in connection with holidays, when Norwegians have a tendency to increase their consumption level. There are also campaigns that are aimed at pregnant women in order to reduce harm to unborn babies.

## **5.2 Interventions in the health care sector are mainly aimed at the ones with the most severe problems**

Interventions in the health care sector are aimed at individuals with a problematic consumption level or people who are affected by someone else's drinking. The kind of intervention differs across individuals, depending on their drinking pattern, consumption level and types of consequent problems. Looking back at the alcohol pyramid in Chapter 3, one can say that the needed treatment varies for the different groups in the pyramid. The

interventions vary widely in type, cost and geography. The following is not a complete list, but indicates the variety:

- GPs' informal screening for alcohol problems (varies widely across GPs)
- Consultations with GPs, private practising psychiatrists and psychologists with and without contract with the Regional Health Authorities
- Medical treatment within various psychiatric institutions not primarily aimed at alcohol-related problems
- Medical treatment in special care for drug- and alcohol-related problems
- Pharmaceuticals

When searching Felleskatalogen (“The Norwegian Physician Desp Top for Pharmaceuticals”) using the term “alcohol” as indication, the following drugs are listed: Antabus, Campral, Fluanxol, Heminevrin, Naltrexone POA Pharma, Nycoplus B-total, Selincro, Stemetil, Tegretol, Trilafon, Trimonil, Truxal and Vallergan. Only Antabus, Campral and Naltrexone POA Pharma have alcohol-related problems as the only indication (with abstinence being the goal). The remaining drugs have other indications, and the proportion of alcohol-related use is uncertain. Selincro (nalmefene) has recently been approved for the market for reduction of alcohol consumption, but had no sales in 2012.

Most of the treatments in the health care sector for alcohol abuse and dependency are however aimed at the individuals with the most severe problems. This group is small compared to the group of individuals with mild dependency problems and high risk of developing acute problems and chronic harm. These individuals have a problematic drinking pattern in the sense that it is likely to cause problems for themselves and others. It might however not be obvious to everyone around them that they have a problematic drinking pattern, and they are themselves probably unsure about whether or not their drinking is problematic or “normal”.

Rehm et al. (2012) estimates that less than 1 out of 10 individuals with an alcohol dependency problem in Europe receives some kind of treatment for their problem.

## 6 Discussion

The previous chapters show that consumption of alcohol has a range of positive and negative consequences. Despite its positive consequences, alcohol has a range of negative consequences for those with high intake and those around them.

Quantification and valuation of the consequences raises a range of issues, however. Studies of consequences require valid estimates of the exposure: the amount of alcohol consumed. There is clear evidence that most people underreport their consumption level. This underreporting is unlikely to be constant across consumption level which will then bias the effect estimates.

Also, there may be uncertainty about the causal link between alcohol intake and the consequences. This is the case for positive as well as negative consequences. Alcohol has been used to treat a range of diseases, but evidence of effectiveness is lacking for most of them. Also, there is uncertainty about *the extent* to which alcohol is causing diseases. The International Agency for Research on Cancer (IARC) concludes that “The occurrence of malignant tumours of the oral cavity, pharynx, larynx, oesophagus and liver is causally related to the consumption of alcoholic beverages”<sup>26</sup>. However, quantification of the risk is difficult because consumption of alcohol is associated with smoking which is a strong carcinogenic. Similar uncertainty is present for other diseases as well. Several ICD10-diagnoses indicate that alcohol is the cause of the disease (e.g. alcoholic cardiomyopathy), but again there is uncertainty with respect to whether diagnoses have been correctly made or reported. When increased morbidity and mortality is translated into costs, there is uncertainty with respect to unit costs such as the cost of treating a traffic accident or the value of one day work absenteeism.

Despite all such uncertainties, there is no doubt that the use of alcohol has very large costs whether these are measured in monetary terms or other terms. According to our estimates, the societal cost of alcohol in Norway in 2011 was approximately NOK 22 billion. This estimate includes health care costs, preventive measures, loss of productivity and accidents such as fires and traffic accidents.

While some of the costs included in our estimate are relatively certain, others are very uncertain. The Norwegian Health Economics Administration (HELFO) finds that there were approximately 89,000 visits to GPs for alcohol-related problems. This number is obviously a

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<sup>26</sup> <http://monographs.iarc.fr/ENG/Monographs/vol44/volume44.pdf>.

gross underestimate, mainly because GPs in many cases state a different diagnosis in order to protect the patient from stigma. Also, doctors may be unaware of the fact that alcohol is an underlying problem behind reported symptoms. Similar underestimates are likely to be present for specialist care. Here, we included some alcohol-related diagnosis where alcohol is not mentioned in the name. We also included the alcohol-attributable proportion of patient contacts with ICD-10 diagnoses I61 (intracerebral haemorrhage), I62 (other nontraumatic intracranial haemorrhage) and I63 (cerebral infarction).<sup>27</sup>

Productivity losses from excessive alcohol consumption are difficult to estimate, first because we the costs of job absenteeism in Norway are uncertain, and second because the proportion of them attributable to alcohol is uncertain. Here, the use of non-alcohol diagnoses to avoid stigma will likely lead to underestimates. There is no doubt, however, that the costs run in the billions.

Alcohol is obviously a causal factor in many traffic accidents. Here, statistics may be relatively good. However, when using cost data from the Norwegian Institute of Transport Economics (TØI), we may have double counted some costs.

When considering all the monetary costs of excessive alcohol use, it seems likely that our total number is an underestimate. However, the non-quantifiable costs in terms of suffering and lost health and life years may be even more important.

Gjelsvik (2004) estimated the societal cost of alcohol abuse to be between NOK 18 billion and 20 billion, which is relatively similar to our estimate of NOK 22 billion. The included costs differ slightly. In addition to most of the costs we have included, Gjelsvik (2004) includes costs related to ambulance services (NOK 269-420 million) and loss of productivity because of lower quality of work (NOK 8,716 million), unemployment (NOK 930 million) and early deaths (NOK 339-1,074 million). Gjelsvik's estimate of the loss of productivity due to unemployment is significantly lower than our estimate. Costs that are not included in Gjelsvik (2004), but that are included in our estimate, are related to preventive measures (Blue Cross, Salvation Army, AKAN), research on the subject (SIRUS), and loss of productivity because of early retirement and long-term absenteeism from work life. In addition, we have included Gjelsvik's estimate of alcohol-related crime.

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<sup>27</sup> Calculations based on the relative risk of haemorrhagic stroke and ischaemic stroke when alcohol intake equals 100 g of alcohol per day (Norwegian Knowledge Centre for the Health Services, 2013), and the assumption that 6 per cent of the Norwegian population has this consumption level.



The high negative cost of alcohol consumption calls for prevention and treatment. It should be noted, however, that the high costs of alcohol use are not an argument per se for public funding of interventions. The crucial issue of interventions is the size of the external effects and the size of the direct cost in relation to the benefits of them. In theory a “rational addict” could prefer lower income and remain addicted.

This raises ethical questions, however. While some would argue that the aim of all interventions is to achieve zero consumption, other would argue that a modest consumption is acceptable or even desirable. The latter would consequently argue that intervention should target “excessive” consumption. If the aim of the alcohol policies were stated explicitly by politicians, the next step would be to evaluate the costs of interventions and policies, their benefits in terms of less alcohol use and other consequences and finally the avoided costs from less morbidity and mortality. A range of interventions have been proposed or implemented, and Medline have approximately 1500 citations of publications with alcohol and cost-effectiveness as key words. Such analyses may inform decisions about optimal choice of interventions even though the uncertainties in quantifying the consequences of alcohol use necessarily carry over to the cost-effectiveness analyses.

The increasing consumption of alcohol in Norway (and other countries) indicates that society may do well at searching for prevention and treatment which can reduce the negative consequences and maintain the positive ones as far as this is politically desirable. Even though use of alcohol raises ethical questions, economic analyses should be an integral part of the information basis for alcohol policies. Data collected in this report may therefore represent input in subsequent economic analyses.

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## Appendix

*Table A1-1 Number of patient contacts by main diagnosis for age group >19, private somatic specialists with contract with regional health authorities, 2011*

ICD-10	Diagnosis	In total	Male	Female
F10	Mental and behavioural disorders due to use of alcohol	15	12	3
G621	Alcoholic polyneuropathy	23	20	3
I20	Angina pectoris	3 181	2 028	1 153
I21	Acute myocardial infarction	76	67	9
I25	Chronic ischaemic heart disease	10 018	8 197	1 821
I61	Intracerebral haemorrhage	17	8	9
I62	Other nontraumatic intracranial haemorrhage	9	8	1
I63	Cerebral infarction	305	185	120
J10	Influenza due to other identified influenza virus	8	2	6
J11	Influenza with pneumonia, virus not identified	15	7	8
J12	Viral pneumonia, not elsewhere classified	2	0	2
J15	Bacterial pneumonia, not elsewhere classified	49	22	27
J18	Pneumonia, organism unspecified	49	33	16
J20	Acute bronchitis	245	111	134
J21	Acute bronchiolitis	9	1	8
J22	Unspecified acute lower respiratory infection	112	46	66
K70	Alcoholic liver disease	5	4	1
K74	Fibrosis and cirrhosis of liver	23	7	16
K85	Acute pancreatitis	8	7	1
K861	Other chronic pancreatitis	11	3	8

Source: Norwegian Patient Register

*Table A1-2 Number of patient contacts by main diagnosis for age group >19, public psychiatric care for adults, 2011*

ICD-10	Diagnosis	In total	Male	Female
F10	Mental and behavioural disorders due to use of alcohol	16 810	10 611	6 199
G312	Degeneration of nervous system due to alcohol	19	17	2
I20	Angina pectoris	1	0	1
I21	Acute myocardial infarction	4	2	2
I61	Intracerebral haemorrhage	4	3	1
I62	Other nontraumatic intracranial haemorrhage	2	1	1
I63	Cerebral infarction	14	7	7
J15	Bacterial pneumonia, not elsewhere classified	7	1	6
J18	Pneumonia, organism unspecified	4	1	3
K70	Alcoholic liver disease	1	1	0
Y91	Evidence of alcohol involvement determined by level of intoxication	2	1	1
Z721	Problems related to lifestyle - alcohol use	15	8	7

Source: Norwegian Patient Register

*Table A1-3 Number of patient contacts by main diagnosis for age group >19, private psychiatric specialists with a contract with regional health authority, adults, 2011*

ICD-10	Diagnosis	In total	Male	Female
F10	Mental and behavioural disorders due to use of alcohol	1 520	1 084	436
I63	Cerebral infarction	61	44	17

Source: Norwegian Patient Register

*Table A1-4 Number of patient contacts in psychiatric care for children and young people, 2011*

ICD-10	Diagnosis	In total
F10	Mental and behavioural disorders due to use of alcohol	70

Source: Norwegian Patient Register

*Table A1-5 Number of patient contacts by main diagnosis for age group >19, specialised interdisciplinary treatment for substance abuse, 2011*

ICD-10	Diagnosis	In total	Male	Female
F10	Mental and behavioural disorders due to use of alcohol	73 952	47 300	26 652
K70	Alcoholic liver disease	2	0	2
Z502	Alcohol rehabilitation	31	30	1
Z714	Alcohol abuse counselling and surveillance	209	99	110
Z721	Problems related to lifestyle - alcohol use	51	33	18

Source: Norwegian Patient Register

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