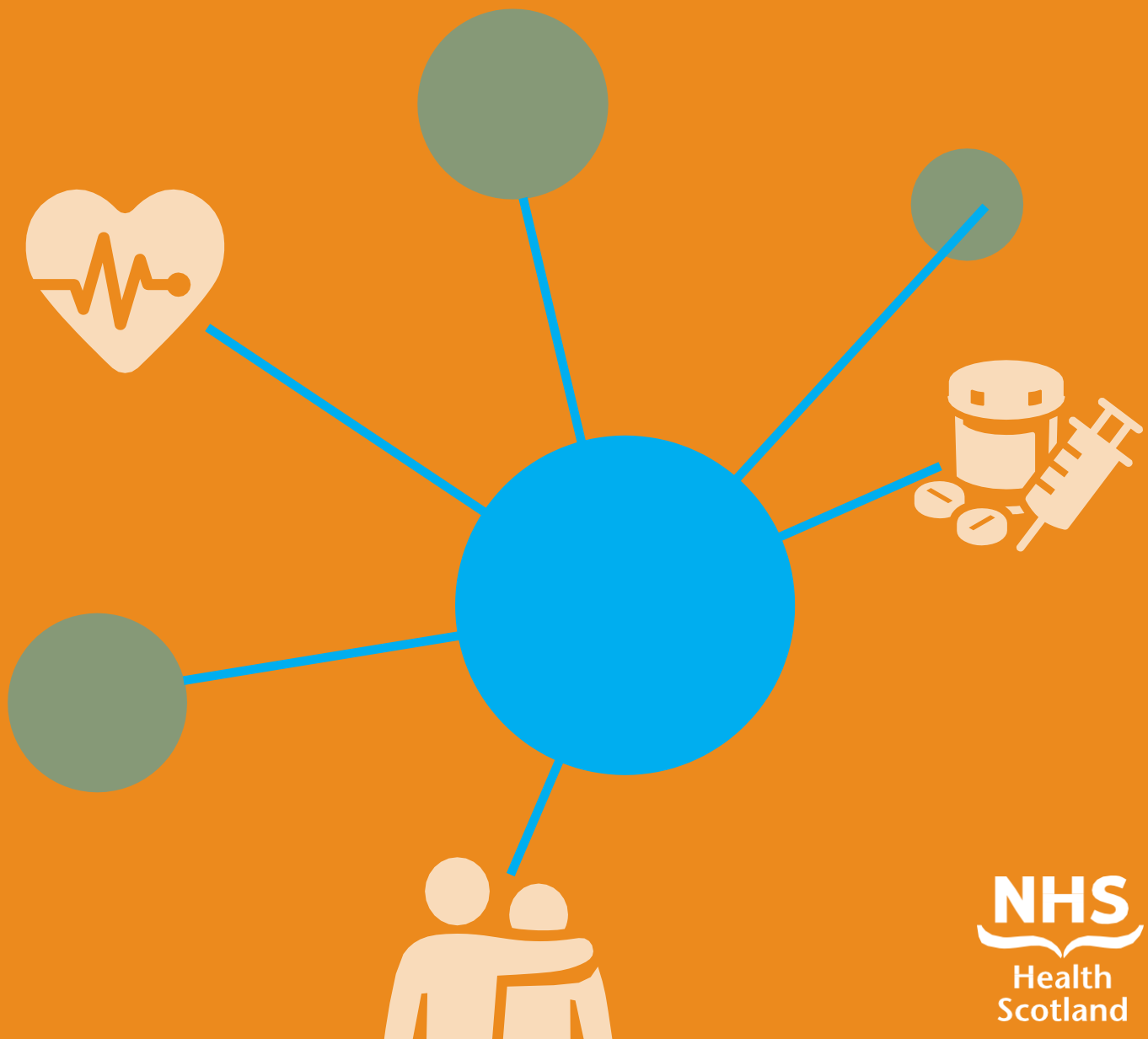



The Scottish Burden of Disease Study, 2016

Alcohol dependence technical overview



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1 South Gyle Crescent
Edinburgh EH12 9EB

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Background

The Scottish Burden of Disease (SBoD) study team have published comprehensive estimates of the burden of disease and injury in Scotland for 2016 [1]. The purpose of this technical overview is to provide background information on the data and methodology used, noting any caveats associated with estimating the burden of alcohol dependence in SBoD.

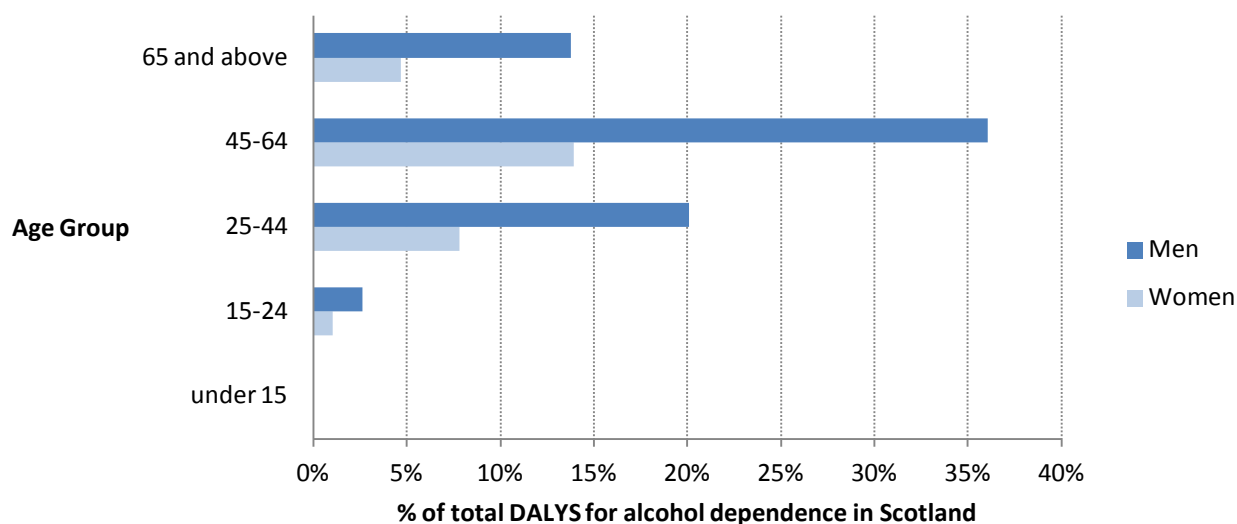
Burden of disease studies aim to estimate the difference between ideal and actual health in a country or region at a specific point in time. Individuals can suffer non-fatal health loss due to suffering disability attributable to a disease or injury, or suffer fatal health loss which is early death due to a disease or injury. To quantify the total burden, non-fatal and fatal health loss are combined to produce a single metric called the Disability-Adjusted Life Year (DALY).

In SBoD 2016, all data are presented as three year averages for period 2014-2016. A three year period is used to smooth out most of the effect if the mortality or morbidity of a single year happens to be unusual. Further information about the SBoD study, including a more thorough explanation of the methodology used, overview reports, detailed results and other specific disease briefings can be found on the website of the Scottish Public Health Observatory (ScotPHO) [1].

Estimated burden due to alcohol dependence

Alcohol dependence was the 13th most common cause of disease burden in Scotland in 2016, resulting in a total of approximately 28,900 DALYs. It was the fourth most common cause of mental and substance use disease burden in Scotland in 2016. Of this total burden, 37% was due to premature mortality attributed to alcohol dependence and 63% was attributed to the health loss suffered as a result of alcohol dependence.

Figure 1 Percentage of total DALYs by gender and age-group for alcohol dependence



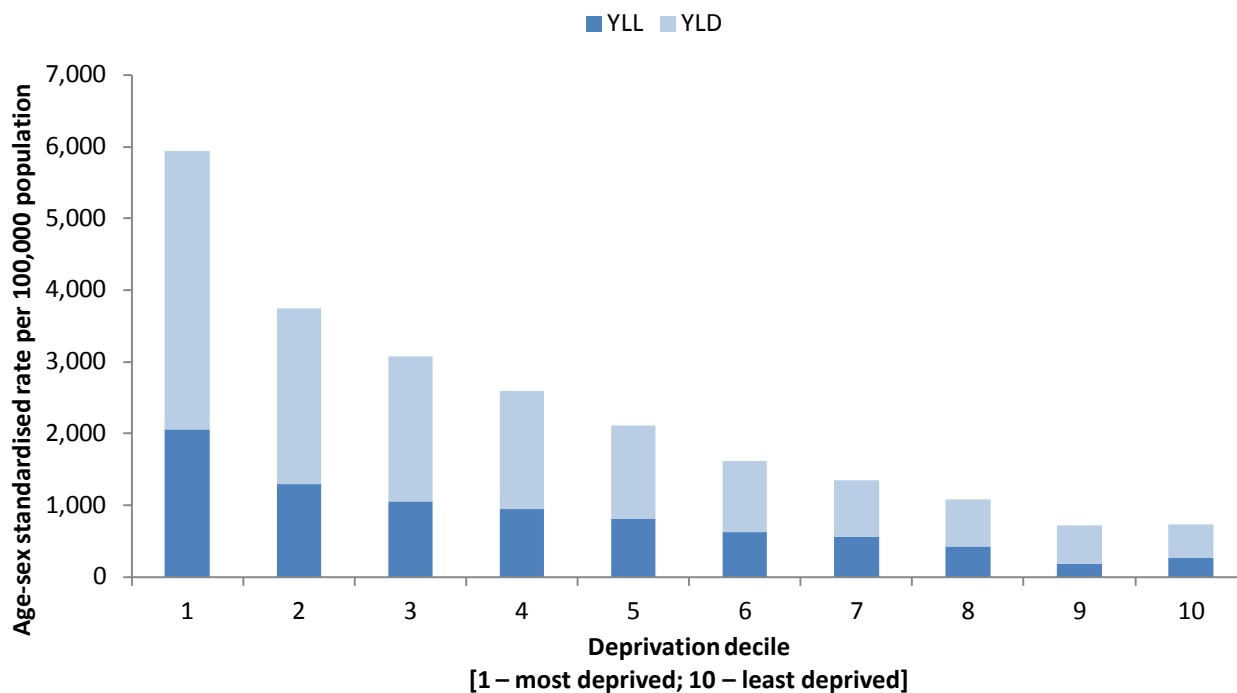
* Please note, we have not estimated the burden of depression in individual's aged under 15 years (see QI section for further explanation).

Overall, the alcohol dependence burden in men accounted for around three-quarters (73%) of the total alcohol dependence DALY in Scotland in 2016, as outlined in Figure 1. Men aged 45 to 64 years accounted for the largest share (36%) of this burden, followed by men aged 25 to 44 years (20%). Women aged 45 to 64 years and men aged 65 years and over contributed the third highest share (14% respectively) of the alcohol dependence burden in Scotland. Overall, individuals under 15 years of age accounted for less than one per cent of the total alcohol dependence burden in Scotland. Note that the burden we are describing above is the absolute burden and has not been adjusted for the age/gender case-mix.

The age standardised DALY rates for alcohol dependence, by deprivation¹ decile, are shown in Figure 2. The DALY burden increased with increasing levels of deprivation: individuals in the most deprived decile experienced a burden that was 8 times greater than individuals in the least deprived decile.

¹ We used the Scottish Index of Multiple Deprivation (SIMD 2016) to analyse patterns of inequality in the burden of disease across Scotland. SIMD2016 is categorised into deciles 1 (most deprived) to 10 (least deprived), SIMD2016 calculates deprived areas, not deprived individuals.

Figure 2 DALYs (rates per 100,000²) of total alcohol dependence burden by deprivation decile



How did we produce these estimates?

DALYs attributed to a disease or injury are calculated by combining estimates from two individual metrics: Years of Life Lost (YLL) due to premature mortality and Years Lived with Disability (YLD).

Years of life lost (YLL) to alcohol dependence

YLL measures the years of life lost due to premature deaths i.e. the fatal component of burden of disease. YLLs are calculated by subtracting the age at each alcohol dependence death from the expected remaining life expectancy for a person at that age.

Estimating the number of deaths

For the period 2014-2016, we estimated an average of 453 deaths per year caused by alcohol dependence. These deaths were identified from the underlying cause of death on the National Records of Scotland (NRS) register of deaths [2]. To classify deaths the GBD 2015 cause list was used, which has been created using the International Statistical Classification of Diseases and Related Health Problems (ICD-10) [3, 4]. The NRS register of deaths has a Community Health Index (CHI) number attached to each death, which allows for demographic data such as gender, geographical area of residence and age at death to be established for each individual.

² Where the data were age-standardised, this was done directly using the 2013 European Standard Population to account for differences in age structure between SIMD deciles.

Included in the total alcohol dependence mortality count are deaths that have come from what are termed ill-defined causes of death in burden of disease studies. These ill-defined deaths are causes of death that have been coded with ICD-10 codes in vital registers but for the purposes of burden of disease studies, are not regarded as sufficiently specific causes of death. In SBoD, these ill-defined deaths are redistributed amongst specific causes of death across the burden of disease cause list based on the secondary causes of death recorded on the death certificate. For a small number of cases, where there was no additional information relating to secondary causes of death, the individuals clinical history was evaluated to inform the target cause for redistribution. For alcohol dependence, approximately 9% of the mortality count comes from these ill-defined deaths. For this reason, the number of deaths due to alcohol dependence which have been reported are different from that of officially reported sources. Further explanation of this method is available in the Invited chapter of The Registrar General's Annual Review of Demographic Trends [5].

Life expectancy and YLL

Each single death contributes to the total YLL through calculating the difference between the age at death and the life expectancy at that age. Life expectancy was defined using the 2013 gender-specific National Life Tables for Scotland [6]. There were approximately 10,700 YLL due to alcohol dependence in Scotland in 2016. Dividing the total YLL for alcohol dependence by the total mortality count indicates that, on average, individuals who die due to alcohol dependence die approximately 24 years earlier than would otherwise be expected on the basis of the life expectancy of the general population.

Years lived with disability (YLD) due to alcohol dependence

Years lived with disability (YLD) are estimated using:

- disease and injury prevalence estimates
- levels of severity
- disability weights

Our sources of information for these three components are as follows:

Prevalence

We used the [Scottish Health Survey](#) to estimate prevalence of depression in Scotland. The Scottish Health Surveys (SHeS) are a series of stratified, cluster-sampled, cross-sectional surveys designed to measure the health of a representative sample of the Scottish population living in private households. This survey series started in 1995 with latest survey carried out in 2017 [7].

Since 2012, the Alcohol Use Disorders Identification Test (AUDIT) questionnaire has been used in SHeS to assess problem drinking. The AUDIT questionnaire was primarily designed to screen for levels of alcohol dependency or high-risk use³. In line with the World Health Organisation (WHO) guidelines on using the tool, responses to each of the ten AUDIT questions in SHeS were assigned values of between 0 and 4. Scores for the ten questions were summed to form a scale, from 0 to 40. In SBoD, and in line with WHO guidelines for interpreting AUDIT scale scores [8], those individuals with a score of 16 or more on the AUDIT scale were considered to be the 'alcohol dependent' population in Scotland. We have used the SHeS survey prevalence by gender, of those reporting a score of 16 or more on the AUDIT scale, taking an average from SHeS surveys 2012-16 (five survey waves). The survey prevalence was then multiplied with the NRS population estimate (2016), for males and females separately, to obtain expected number of cases of alcohol dependence by gender.

Pooling SHeS AUDIT scores between 2012-2016, we have estimated that approximately 3% of men and 1% of women, aged 16 years and over, were harmful drinkers or alcohol dependent. Based on this, we estimated that there were approximately 107,500 individuals with alcohol dependence in Scotland in 2016.

Severity distribution and disability weights

The levels of severity and disability due to alcohol dependence in Scotland were based on the specifications of the GBD 2016 study [9]. This allowed prevalent cases to be disaggregated by levels of severity and the associated disability at each level of severity. The disability weights were developed by the GBD study through surveys of the general public and take into account the consequences of each disease, condition and injury [10]. The severity distributions and disability weights for alcohol dependence are outlined in Table 2 below.

Once the severity of alcohol dependence and associated disability were taken into account, individuals were estimated to be suffering approximately 18,100 YLDs in 2016 due to living with alcohol dependence.

³ AUDIT comprises ten indicators of problem drinking: three indicators of consumption, four of use of alcohol considered harmful to oneself or others, and three of physical dependency on alcohol.

Table 2 Description and allocation to severity levels for alcohol dependence with corresponding disability weight

Severity level	Description	% of individuals	Disability weight
Very mild	Drinks alcohol daily and has difficulty controlling the urge to drink. When sober, the person functions normally.	79	0.123
Mild	Drinks a lot of alcohol and sometimes has difficulty controlling the urge to drink. While intoxicated, the person has difficulty performing daily activities.	7	0.235
Moderate	Drinks a lot, gets drunk almost every week and has great difficulty controlling the urge to drink. Drinking and recovering cause great difficulty in daily activities, sleep loss, and fatigue.	6	0.373
Severe	Gets drunk almost every day and is unable to control the urge to drink. Drinking and recovering replace most daily activities. The person has difficulty thinking, remembering and communicating, and feels constant pain and fatigue.	8	0.570

Data quality

In order to provide a measure of the degree of accuracy⁴ and relevance⁵ of the estimated disease DALYs to users, a measure of data quality has been developed for the SBoD study. This measure assigns a RAG (Red; Amber; Green) status to each disease or injury indicative of the accuracy and relevance of the estimates. Interpretation of the RAG status can be defined as follows:

Highly accurate and relevant

Estimates have been derived using relevant and robust data sources with only a small degree of adjustments performed to the input data.

Moderately accurate and relevant

Estimates have been derived using reasonably relevant and robust data sources with only a moderate degree of adjustments performed to the input data.

Uncertainties over accuracy and relevance

Estimates have been derived using less comprehensive or relevant data sources with a high degree of adjustments performed to the input data.


⁴ How precise, unbiased or certain the estimate is.

⁵ Do we measure the thing we want to measure?

The data quality has been assessed using three main criteria:

- Relevance and accuracy of the data source used to measuring the population of interest
- Likelihood that the implemented disease model captured the overall burden of disease or injury
- The relative contribution of ill-defined deaths to YLL, and YLL to DALY.

These criteria are subjectively assessed and each criterion is scored on a scale of 1 to 5. Further details on these data quality measures are available on the ScotPHO website [1].

Based on above criteria, the estimates of burden of alcohol dependence in Scotland are  **moderately accurate and relevant.**

Our estimate of the prevalence of alcohol dependence, used in the YLD component of the DALY, is likely to be an underestimate of the true levels of alcohol dependence in Scotland. Alcohol consumption estimates from SHeS are based on self reported data collected during the survey interview. However, it is well established that national population surveys under-report levels of alcohol consumption in the general population. There are two factors which are usually cited to account for this underestimation: (i) under-reporting and (ii) low response rates in general population drinking surveys [11, 12]. In Scotland, studies suggest that in comparison with alcohol sales data, population surveys may understate overall alcohol consumption by approximately 50% [13, 14]. Gray et al (2012) also found lower alcohol-related mortality rates among SHeS respondents compared with the general population, suggesting that SHeS respondents are likely to report lower alcohol consumption levels than would be expected if a truly representative sample had been obtained, thereby contributing to an underestimation of population consumption levels [15]. Non-response bias in SHeS has also been found to be greater among individuals residing in the most deprived areas, which suggests that corresponding underestimation of population rates of alcohol consumption is likely to be socially patterned [16].

The overall impact of this underestimation on the alcohol dependence DALY will depend on firstly, the number of alcohol dependent drinkers among non-responders in SHeS and secondly, the severity distribution of this unknown population of alcohol dependent drinkers i.e. how many are very mild, mild, moderate or severe. For example, a 10% increase of our current alcohol dependence prevalence estimate, and assuming the same severity distribution as outlined in Table 2 above, would result in approximately 11,000 additional YLD. This would move alcohol dependence from its current rank of 13th to 12th. A 50% increase in our current alcohol dependence prevalence estimate, would result in approximately 55,000 additional YLD and alcohol dependence would be ranked as the 3rdⁿ leading cause of disease burden in Scotland.

What next to improve estimates for alcohol dependence?

Future work on the SBoD study will work to refine our estimates of prevalence. This work will include investigating the impact of under reporting of alcohol consumption and the effect of non-response bias on the alcohol dependence prevalence figure used in the YLD component of the DALY. Further to this, work will also be carried out to attempt to derive estimates of alcohol dependence severity levels that are dependent on age and that are specific to the Scottish population.

These improvements are partly dependant on exploring other data sources and reviewing evidence from high quality research that it is relevant to Scotland. Please contact the SBoD project team (nhs.healthscotland-sbod-team@nhs.net) for enquiries and suggestions on how to improve our estimates.

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