ScotPHO
Public Health Information for Scotland

Scottish Burden of Disease Study, 2015

Other cardiovascular and circulatory diseases technical overview

NHS National Services Scotland

ISD SCOTLAND

NHS Health Scotland

This resource may also be made available on request in the following formats:

0131 314 5300

nhs.healthscotland-alternativeformats@nhs.net

Published by NHS Health Scotland

1 South Gyle Crescent
Edinburgh EH12 9EB

Background

The Scottish Burden of Disease (SBoD) study team have published comprehensive estimates of the burden of disease and injury in Scotland for 2015 [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 Other Cardiovascular and Circulatory Diseases (OCVD) in SBoD. The conditions that are grouped under OCVD are:

- Varicose veins of lower extremities and pelvis organs
- Phlebitis and thrombphlebitis
- Non-rheumatic valvular disorders
- Other cardiovascular and circulatory diseases with heart failure

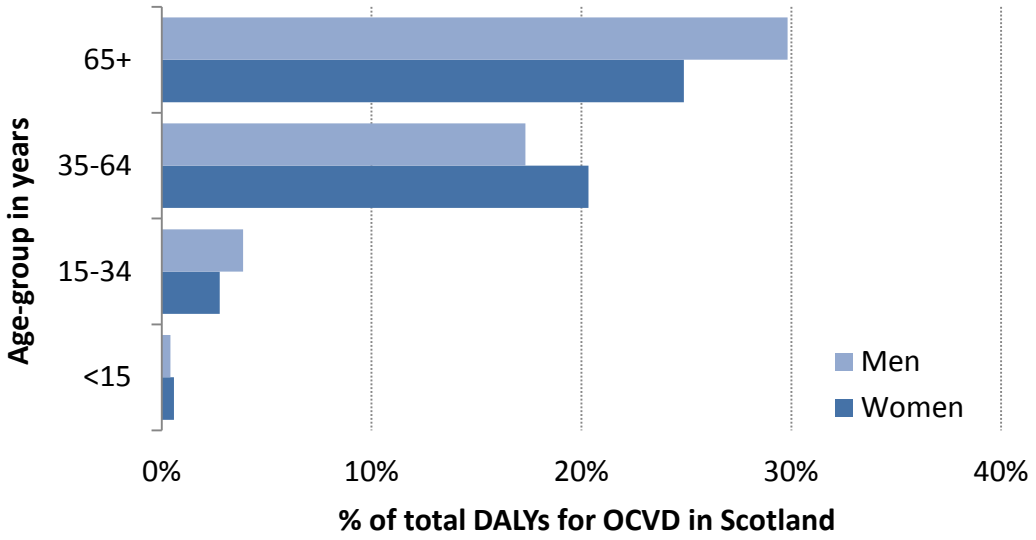
Burden of disease studies aim to estimate the difference between ideal and actual health in a country or region at a specific point in time. Individuals can suffer non-fatal health loss due to suffering disability attributable to a disease, condition or injury, or suffer fatal health loss which is early death due to a disease, condition 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).

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 for other cardiovascular and circulatory disease

OCVD was the 17th most common cause of disease burden in Scotland in 2015, resulting in a total of approximately 21,100 DALYs. Of this total burden, 57% was due to premature mortality attributed to OCVD and 43% was attributed to health loss suffered due to living with OCVD.

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



Men and women contributed a similar share to the overall burden (49% vs. 51%). Overall 55% of the total OCVD burden was contributed by individuals aged 65 years and over, as outlined in Figure 1. Note that the burden we are describing is the absolute burden and has not been adjusted for the age/gender case-mix.

How did we produce these estimates?

DALYs attributed to a disease, condition 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) due to other cardiovascular and circulatory disease

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 OCVD death from the expected remaining life expectancy for a person at that age.

Estimating the number of deaths

There were 1,048 deaths caused by OCVD in 2015. 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.

Included in the total OCVD 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. These ill-defined deaths are therefore redistributed amongst specific causes of death across the burden of disease cause list based on the redistribution of deaths method used in the GBD study [3]. For OCVD, approximately 29% of the mortality count comes from ill-defined death categories such as ‘pulmonary embolism’. Further explanation of this method is available in the SBoD technical paper [1]. For this reason, the number of deaths due to OCVD which have been reported are different from that of officially reported sources.

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 [5]. There were approximately 12,000 YLL due to OCVD in Scotland in 2015. Dividing the total YLL for OCVD by the total mortality count indicates that, on average, individuals who die due to OCVD die approximately 11 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 other cardiovascular disease

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 were as follows:

Estimating the number of individuals suffering disability

To estimate prevalent cases of OCVD in 2015, the Scottish Morbidity Records 01 (SMR01) was used [6]. This dataset contains structured data in the form ICD-10 codes relating to diagnoses made on discharge from general and acute hospitals during inpatient episodes and day cases. There are up to six individual ICD-10 codes that can be recorded, where the primary diagnosis relates to the main reason for the hospital episode of care, and the other secondary diagnoses refer to co-morbidities that may affect care during that hospital episode of care.

The SMR01 dataset has a CHI number attached to the hospital episode of care, which allows for the identification of records for an individual. This CHI number has been linked to records from the NRS register of deaths, to exclude individuals that have died from prevalence estimates that relate to a period following their date of death [2]. The number of individuals that had a primary diagnosis of OCVD between 1 January 2006 to 31 December 2015 was used to estimate the number of prevalent cases.

Using this method of identifying prevalent cases of OCVD, we estimated that there were approximately 130,800 individuals in the Scottish population suffering disability due to OCVD in 2015.

In accordance with the GBD2015 study [7] we assigned a different disability weight and distribution to prevalent cases of OCVD with and without heart failure. The number of individuals that had both a hospital diagnosis of OCVD and heart failure

between 1 January 2006 to 31 December 2015 were used to estimate the number of prevalent cases of OCVD with heart failure. This period was used to take into account the long term consequences of OCVD, as well as capture the cases that completely recover from the disease. These individuals were a subset of the 130,800 OCVD prevalent patients. We excluded individuals that also had diagnosis of ischaemic heart disease or a myocardial infarction, because for those individuals we assumed that the heart failure was caused by the ischaemic heart disease.

In addition, a percentage[1] of the number of individuals that had a hospital diagnosis of heart failure between 1 January 1996 to 31 December 2015, for whom we could not assign a specific cause[2], were added to the prevalent count of OCVD with heart failure.

Using this method of identifying prevalent cases of OCVD with heart failure, we estimated that there were approximately 3,700 individuals in the Scottish population suffering disability due to OCVD with heart failure in 2015.

Severity distribution and disability weights

The levels of severity and disability due to OCVD in Scotland were based on the specifications of the GBD 2015 study [7]. 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 [9]. The severity distribution and disability weights for OCVD are outlined in Table 1.

Once the severity of OCVD and associated disability were taken into account, individuals were estimated to be suffering approximately 9,100 YLDs due to living with OCVD.

[1] 14% of the cases, this is extracted from the worldwide prevalence estimates of heart failure according to the aetiology, published by GBD 2013 study [8].
[2] These are diseases in GBD2015 that can cause heart failure including hypertensive heart disease, cardiomyopathy and myocarditis, rheumatic heart disease, endocarditis and chronic obstructive pulmonary disease.

Table 1 Description and allocation to severity levels for OCVD with corresponding disability weight

Severity level	Description	% of individuals	Disability weight
OCVD without heart failure			
Asymptomatic	Has disease or infection but experiences no symptoms by virtue of, for instance being on treatment or because of the natural course of the condition.	28	Nil
Mild	Is short of breath and easily tires with moderate physical activity, such as walking uphill or more than a quarter-mile on level ground. The person feels comfortable at rest or during activities requiring less effort.	30	0.041
Moderate	Is short of breath and easily tires with minimal physical activity, such as walking only a short distance. The person feels comfortable at rest but avoids moderate activity.	15	0.072
Severe	Is short of breath and feels tired when at rest. The person avoids any physical activity, for fear of worsening the breathing problems.	28	0.179
OCVD with heart failure			
Mild	Is short of breath and easily tires with moderate physical activity, such as walking uphill or more than a quarter-mile on level ground. The person feels comfortable at rest or during activities requiring less effort.	25	Nil
Moderate	Is short of breath and easily tires with minimal physical activity, such as walking only a short distance. The person feels comfortable at rest but avoids moderate activity.	20	0.041
Severe	Is short of breath and feels tired when at rest. The person avoids any physical activity, for fear of worsening the breathing problems.	55	0.072

Data quality

In order to provide a measure of the degree of accuracy[3] and relevance[4] 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. These estimates can be considered a highly accurate depiction of the burden incurred from the disease, condition or injury.

 **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. These estimates can be considered a moderately accurate depiction of the burden incurred from the disease, condition or injury.

 **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. These estimates contain substantial uncertainties and should be used with some caution.

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.

[3] How precise, unbiased or certain the estimate is.
[4] Do we measure the thing we want to measure?

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 these criteria, the estimates of burden of OCVD in Scotland are  **moderately accurate and relevant**.

It is difficult to obtain estimates of the number of cases of OCVD, as there is a great deal of variation between the individual conditions within this group. Also, approximately 29% of OCVD deaths have come from ill-defined causes of death, which add additional uncertainty. In our study, we have chosen to use secondary care records to determine the prevalence of OCVD, as using a single source with individual-level records allows us to control for the double counting of individuals therefore restricting any over-estimates of disease burden.

Our study estimated that the prevalence of OCVD 2.4% in Scotland in 2015. In comparison, the Global Burden of Disease study (GBD) 2015 estimated a lower OCVD prevalence of 1.4% [10]. In our study, the non-fatal burden (YLD) contributes a higher proportion of DALYs (43%) than is estimated in GBD 2015 (29%). In SBoD, we use Scottish life expectancy to estimate YLL which means our YLL is always lower than that estimated by GBD (who use an aspirational life expectancy [11]). Nonetheless, even if we had used an aspirational life table our non-fatal burden would still have made up a higher proportion of the DALY compared to the GBD 2015 estimate.

What next to improve estimates for OCVD?

Future work on the SBoD study will attempt to refine estimates of prevalence. An investigation with clinical experts into the individual conditions within this heterogeneous group will be carried out to add additional granularity. This work will include reviewing the coding and recording of OCVD in alternative national datasets and exploring local area datasets for information. The development of the Scottish Primary Care Information Resource (SPIRE) will help us to improve estimates for specific conditions within this group, such as identifying individuals with varicose

veins [12]. Further to this, work will be carried out to attempt to derive estimates of 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.

References

[1] Scottish Burden of Disease study. Scottish Public Health Observatory, Available from: URL: http://www.scotpho.org.uk/comparative-health/burden-of-disease/overview (Accessed 03 July 2017)

[2] National Records of Scotland (NRS). Vital Events - Deaths. Scottish Government, Available from: URL: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths (Accessed 03 July 2017)

[3] GBD 2015 Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet 2016 Oct 8;388(10053):1459-544.

[4] World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010, Geneva. World Health Organization, Available from: URL: http://apps.who.int/classifications/icd10/browse/2010/en (Accessed 03 July 2017)

[5] Office for National Statistics. National Life Tables: Scotland. Open Government Licence, Available from: URL: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/datasets/nationallifetablesscotlandreferencetables (Accessed 03 July 2017)

[6] ISD Scotland. SMR Datasets - Structuring Healthcare Information, http://www.isdscotland.org/products-and-services/structuring-healthcare-information/CHH-IST/SMRDS-HTML2/index.html (Accessed 03 July 2017)

[7] Vos T, Allen C, Arora M, Barber RM, Bhutta ZA, Brown A, et al. Global, regional, and national incidence, prevalence, and years lived with disability for

310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet 2016;388(10053):1545-602.

[8] Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet 2016;386(9995):743-800.

[9] Salomon JA, Haagsma JA, Davis A, de Noordhout CM, Polinder S, Havelaar AH, et al. Disability weights for the Global Burden of Disease 2013 study. The Lancet Global Health 2015 Nov;3(11):e712-e723.

[10] Institute for Health Metrics and Evaluation (IHME). GBD Results Tool. Seattle, WA: IHME, University of Washington. Available from: URL: http://ghdx.healthdata.org/gbd-results-tool (Accessed 03 July 2017)

[11] Global Burden of Disease Study 2015. Global Burden of Disease Study 2015 (GBD 2015) Reference Life Table. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2016.

[12] Scottish Primary Care Information Resource (SPIRE). NHS National Services Scotland, Available from: URL: http://spire.scot/ (Accessed 03 July 2017)

www.scotpho.org.uk
www.healthscotland.scot

6194 7/2017