


The Scottish Burden of Disease Study, 2016

Overview report



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Introduction

Burden of disease is a measure of the health of the population. It aims to quantify the difference between living to old age in good health, and the situation in which healthy life is shortened by illness, injury, disability and early death.

By combining information on fatal burden with the burden of living in less than ideal health (non-fatal burden), planners and policymakers have a better idea of the contribution that different diseases and injuries make to the total burden of disease. This, in turn, provides information to support decisions about where prevention and service activity should be focused. It also provides a way of looking at the proportion of the burden that can be explained by a range of exposures in the population such as poverty or smoking.

Burden of disease studies use a single measure which combines fatal burden [i.e. years lost because of early death – years of life lost (YLL)] and non-fatal burden [i.e. years lost because they are lived in less than ideal health – years lived with disability (YLD)]. The measure used to describe the overall burden of disease is called the disability-adjusted life year (DALY).

Figure 1: How to measure the total DALY for all diseases and injuries in one year



Figure 1 shows the overall DALY for people living in a block of flats for illustrative purposes. In this study we look at DALYs by each disease and injury separately, and by different demographics (such as age or gender).

In any given year, the DALY counts up the years lost due to people dying early in that year and the proportion of that year lost due to living in less than ideal health. The latter is calculated based on duration, severity and the level of disability attributed to that illness. So, in the example above there are $57.6 + 9 = 66.6$ years lost due to people dying early (YLL) and $0.02 + 0.41 = 0.43$ of a year (around 5 months of the year) where the residents of the block of flats are living in less than ideal health (YLD).

Methods

How we calculated the burden of disease for Scotland in 2016

We calculated the burden of disease for 132 disease and injury categories as defined by the international **Global Burden of Disease (GBD) study**. The total burden (DALY) for each category was calculated by adding together the fatal burden (YLL) and non-fatal burden (YLD) for each disease or injury.

Fatal burden

Fatal burden (YLL) was calculated as the years of life lost due to dying earlier than someone in full health. To estimate how many years were lost, we subtracted the age at death from each person's current life expectancy (for this study, we got these data from Scottish life tables).

We extracted cause of death from the death certificate, and where the cause given was not specific enough to allocate to one meaningful category, we redistributed those deaths into other causes (see the technical report for further information).

Non-fatal burden

Non-fatal burden (YLD) is the years lost through living in less than ideal health. This was calculated as:



We only count the YLD within the year we are reporting on, so the maximum YLD an individual can contribute for that year is theoretically one year, although in reality, it will always be lower than this.

Prevalence

The prevalence is a count of how many people have each disease or injury at a specific point in time. To get these data for the whole of Scotland, we extracted information from hospital, GP and prescribing recording systems, and also disease registers. Where necessary, we also used information from surveys, research studies or expert-informed estimates.

To measure the YLD accurately, some diseases and injuries were counted as 'acute' when people had a level of disability for a short (sometimes multiple) burst of time (e.g. upper respiratory infections). Others were counted as 'chronic' when people had a disability or illness for a longer period of time and sometimes for the rest of their lifetime. For example, we assumed that, on average, back pain caused disability for a year after diagnosis but that a stroke caused a lifelong disability. Some diseases and injuries had an acute period and then a chronic period, with different levels of disability.

Severity

The severity distribution is an assumption about what percentage of people we would expect to have mild, moderate and severe disability for each disease and injury. As information on severity was not generally available, we used severity distributions from the GBD study in most instances. As an example, the GBD study estimates that for people living with rheumatoid arthritis, 46.5% have mild disability, 39.3% have moderate disability and 14.2% have severe disability. For each level of severity, we assigned a different level of disability.

Disability weight

The disability weight is the level of disability that the GBD study team have attributed to each disease and injury at each severity level. The weights give a level of disability graded between 0 (no disability) and 1 (death). For example, the disability caused by chickenpox has a very low disability weight of 0.006 whereas active-phase schizophrenia has a very high disability weight of 0.778. The GBD team used three large-scale surveys and expert panels to produce the weights.

Multi-morbidity adjustment

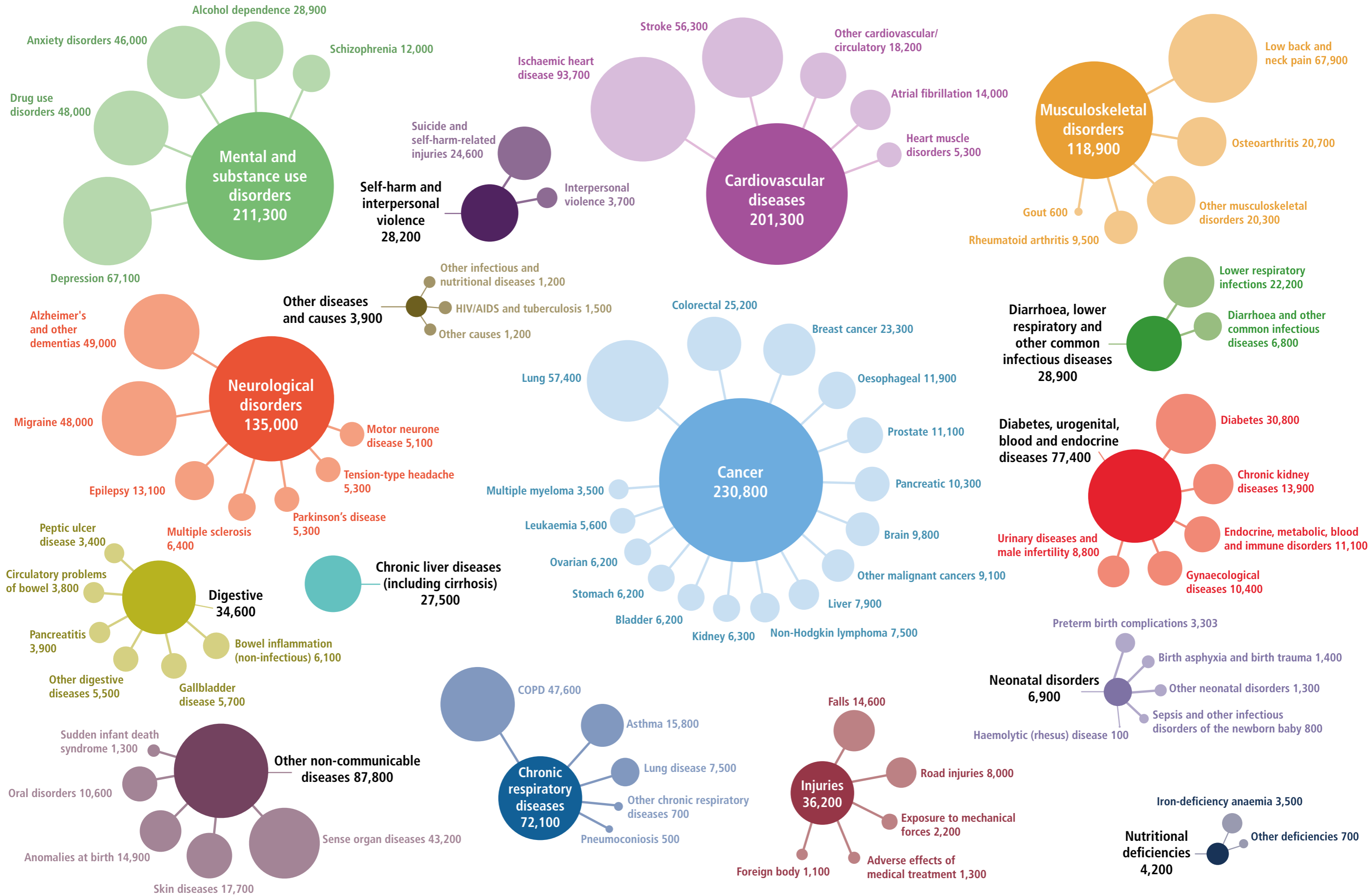
Finally, if someone had more than one disease, the burden they lived with was counted only once in our calculations. We used statistical techniques to make a 'multi-morbidity adjustment', which assumes that a certain proportion of people will have multiple diseases and adjusts the disability accordingly. This means that if someone has had a stroke and has diabetes, their adjusted non-fatal burden across both of these will sum to their total non-fatal burden. It ensures that it is not possible for someone to have 60% disability due to stroke and 70% disability due to diabetes, as these would add up to more than 100% disability.

Results

What was the burden of disease in 2016 in Scotland?

The leading causes of burden in 2016 are shown in **Figure 2**. Overall, when looking at broad groups of diseases and injuries, cancer (neoplasms) caused the biggest burden, followed by mental and substance use disorders, cardiovascular disease, neurological disorders and musculoskeletal diseases. These five groups combined cover 69% of overall burden.

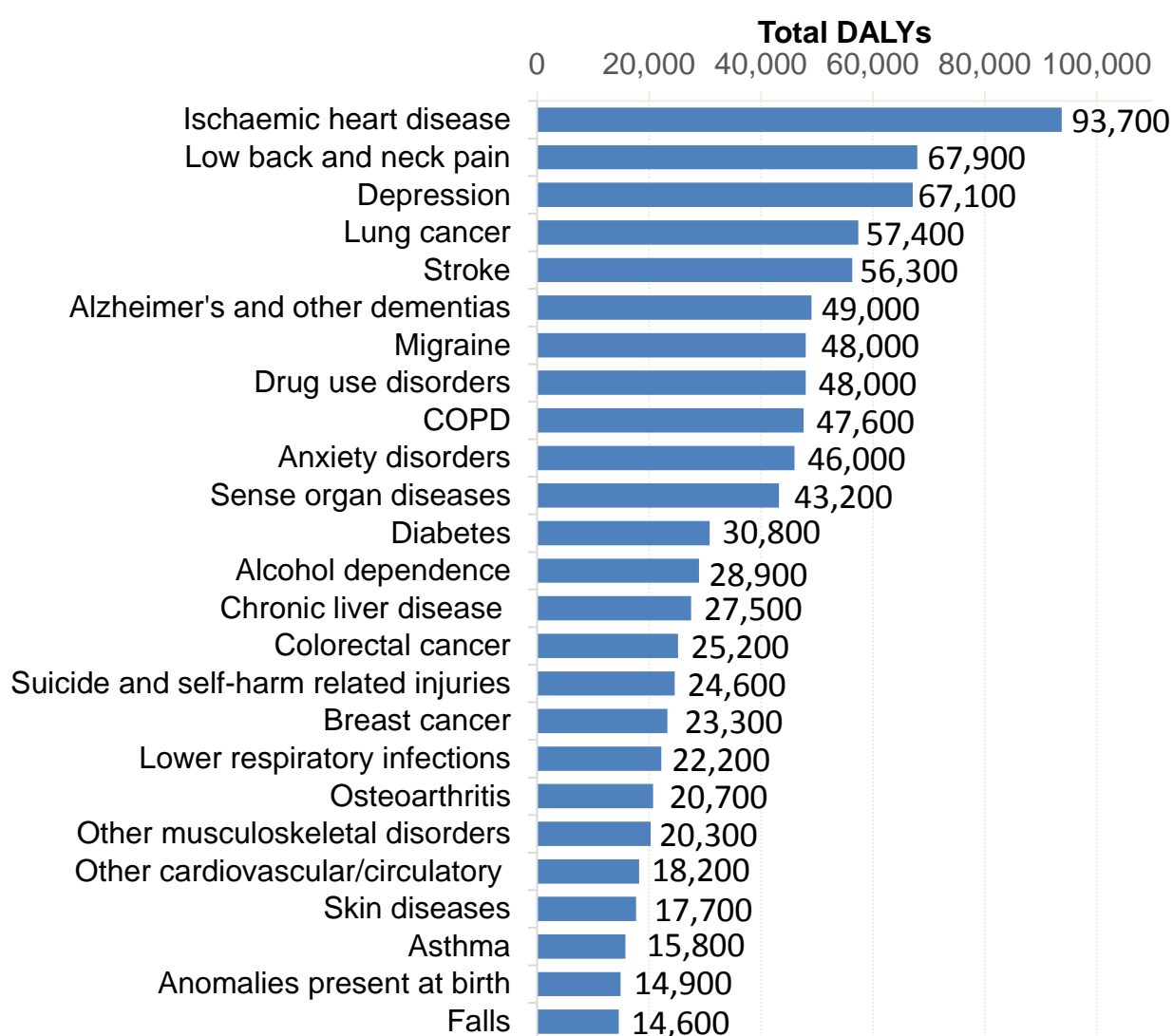
Burden of disease in Scotland, 2016



Note: The small bubbles show only the top 5 illnesses/diseases unless 80-90% of the total DALY, or a high-profile illness, was not captured. • DALY rounded to the nearest 100.

Looking in more detail at the most common individual diseases and injuries, the largest burden was from ischaemic heart disease followed by, low back and neck pain, depression, lung cancer and stroke (29% of the overall burden). The 25 diseases and injuries which cover approximately 72% of the burden of disease in Scotland are shown in **Figure 3**.

Figure 3: Burden of disease (DALY) ranked by 25 individual diseases with the highest burden, Scotland, 2016.



Note: DALYs have been rounded to the nearest 100. The data shown in this figure are also available in Excel format. COPD = chronic obstructive pulmonary disease.

While the overall burden is broadly similar between men and women, with the above 25 diseases accounting for approximately 72% of burden, there are some differences in the disease and injury profiles between men and women (**Figure 4**).

Ischaemic heart disease is the leading contributor to disease burden in men (9.2% of total male burden, compared to 5.2% for women). For women, low back and neck pain is the leading cause of disease burden (6.0% of total female burden, compared to 4.3% for men). Drug use disorders and alcohol dependence contribute a far greater proportion of burden among men than women, while migraine and anxiety contribute more to burden among woman than men (**Figure 4**).

Figure 4: Percentage of DALY and rank for the individual diseases with highest DALYs by gender, 2016

Disease	Men, % of total DALY	Men, rank	Women, % of total DALY	Women, rank	All persons, % of total DALY	All persons, rank
Ischaemic heart disease	9.2%	1	5.2%	2	7.2%	1
Low back and neck	4.3%	5	6.0%	1	5.2%	2
Depression	5.2%	3	5.1%	3	5.1%	3
Lung cancer	4.5%	4	4.3%	8	4.4%	4
Stroke	4.0%	6	4.6%	6	4.3%	5
Alzheimer's and other dementias	2.6%	12	4.8%	5	3.8%	6
Migraine	2.2%	15	5.1%	4	3.7%	7
Drug use disorders	5.3%	2	2.1%	12	3.7%	8
COPD	3.3%	8	4.0%	9	3.6%	9
Anxiety disorders	2.6%	13	4.4%	7	3.5%	10
Sense organ diseases	2.9%	9	3.7%	10	3.3%	11
Diabetes mellitus	2.7%	11	2.1%	13	2.4%	12
Alcohol dependence	3.3%	7	1.2%	24	2.2%	13
Chronic liver disease	2.6%	14	1.6%	18	2.1%	14
Colorectal cancer	2.0%	16	1.8%	15	1.9%	15
Self-harm and suicide	2.7%	10	1.1%	25	1.9%	16

Disease	Men, % of total DALY	Men, rank	Women, % of total DALY	Women, rank	All persons, % of total DALY	All persons, rank
Breast cancer	0.1%	100	3.4%	11	1.8%	17
Lower respiratory infections	1.7%	18	1.7%	17	1.7%	18
Osteoarthritis	1.2%	22	1.9%	14	1.6%	19
Other musculoskeletal disorders	1.3%	20	1.8%	16	1.6%	20
Other cardiovascular/circulatory	1.4%	19	1.4%	21	1.4%	21
Skin diseases	1.2%	25	1.5%	20	1.4%	22
Asthma	1.1%	30	1.4%	22	1.2%	23
Anomalies present at birth	1.2%	24	1.1%	28	1.1%	24
Falls	1.1%	27	1.1%	27	1.1%	25
Total for leading 25 diseases	71.7%		73.1%		71.2%	

Note: Ranks 1-10, 11-19 and 20-100 are shaded in different colours.

The difference between fatal and non-fatal burden

Understanding burden has important implications for prevention activities and for planning the services that will care for the growing number of patients. Having the ability to look at fatal and non-fatal burden together allows us to capture the impact of disease and injury that is lost when looking at mortality alone.

Non-fatal burden is not the same as prevalence of a disease. So, for example, when we say that 98% of suicide and self-harm is fatal, what we mean is that of the people who self-harm, 98% of the burden in that year is due to early death and 2% is due to the physical consequences of having self-harmed at some point in the

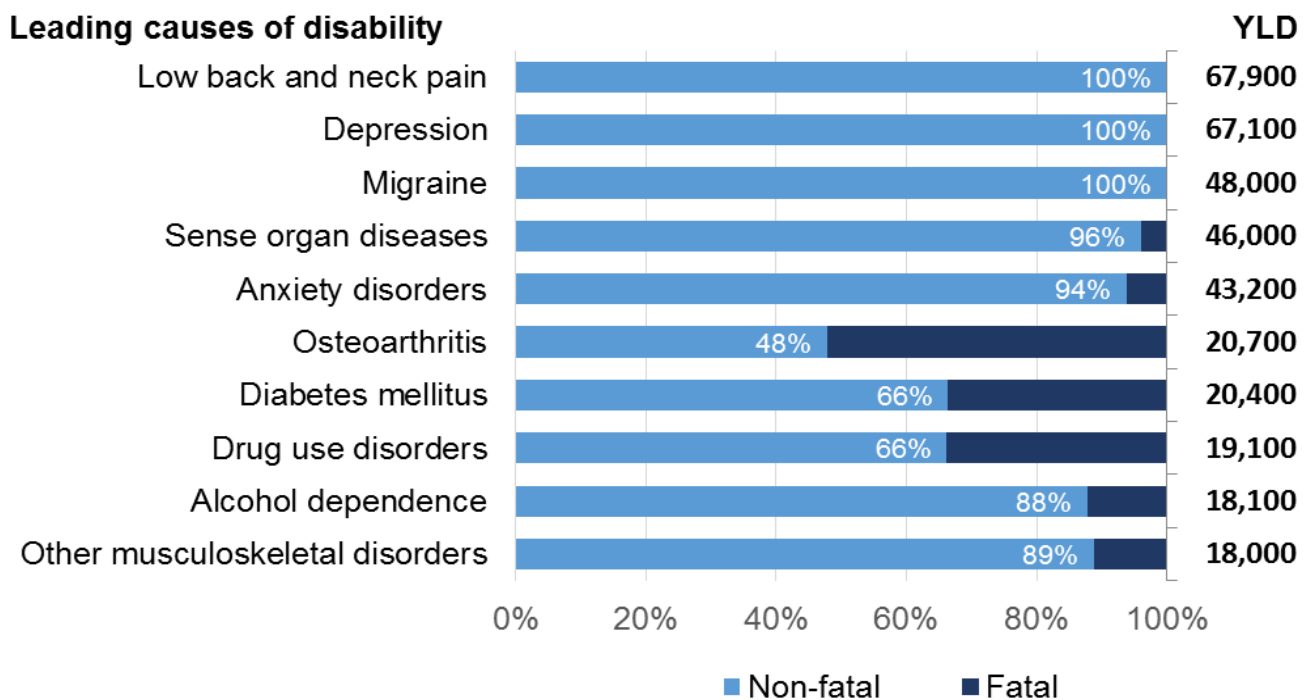
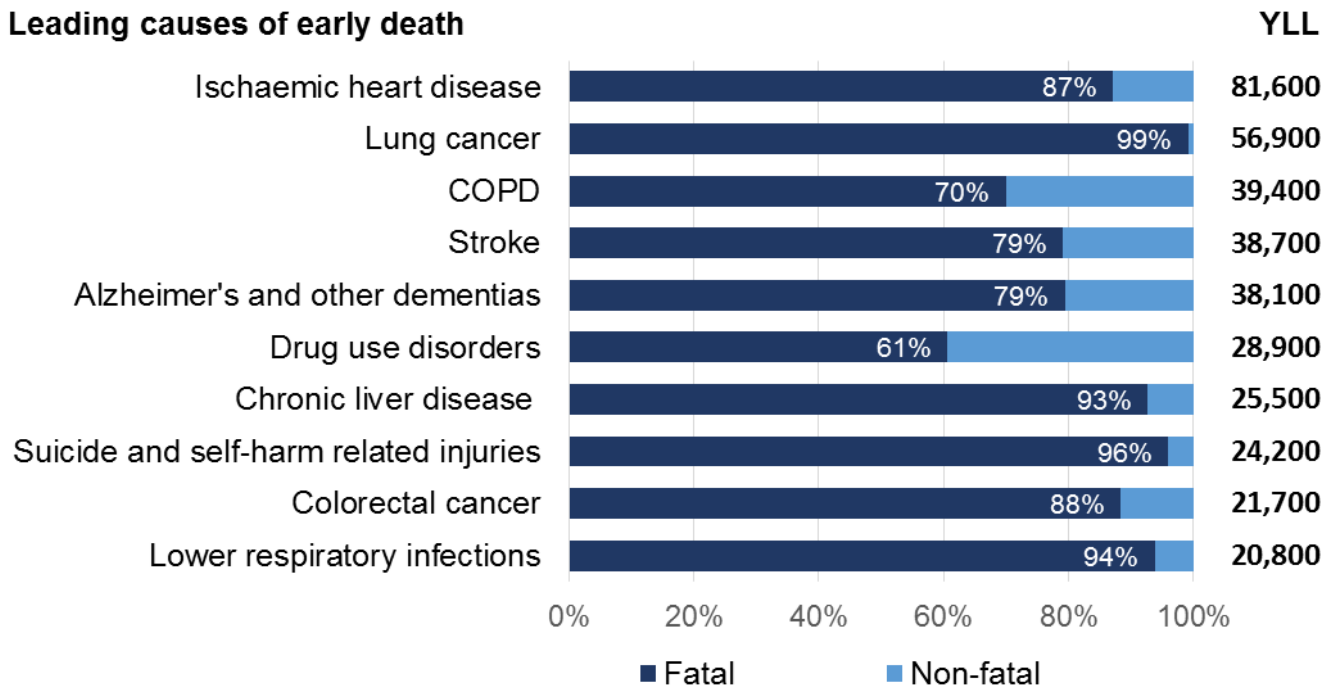
past. We are not saying that 98% of people who self-harm die as a result of self-harming.

The health problems that cause the most fatal burden (YLL) in Scotland are already well documented, and include early deaths due to ischaemic heart disease, lung cancers, chronic obstructive pulmonary disease, cerebrovascular disease (predominantly stroke), Alzheimer's disease and other dementias (see **Figure 5**).

The health problems which cause the most non-fatal burden (proportion of the year lived with disability – YLD), include disability associated with anxiety, depression and dementia, along with diseases caused by our inability to live in ways that create and sustain health (food, exercise, tobacco, alcohol and drugs), and those caused by our living longer.

There were more person-years lived in less than ideal health due to depression in 2016 than there were lost to early lung cancer deaths, and more person-years lived in less than ideal health due to low back and neck pain than lost to early deaths from stroke. A stark reminder that living longer does not necessarily equate to a healthy, happy life. It is right that investment is made in prevention and services to tackle killer diseases, like lung cancer. But it is equally important to address the burden of living in less than ideal health.

Figure 5: Leading causes of early death (total years of life lost: YLL) and disability (total years of life with disability: YLD), Scotland 2016



Fatal and non-fatal burden by age group and gender

Overall, the non-fatal burden accounted for more DALYs in each age group up until the age of 65 years and over in women and in men aged 45 years and over.

Strikingly, the fatal burden was notably higher among men than women in the 15–24 and 25–44 age groups. To illustrate, the fatal burden accounted for 29.8% of the total disease burden for men aged 15–24, compared with only 14.7% in women in this age group. The corresponding figures for the 25–44 age group were 41.0% for men and 24.4% for women (Figures 6 and 7).

Figure 6: Percentage contribution of YLL (fatal) and YLD (non-fatal) in men by age group, Scotland 2016

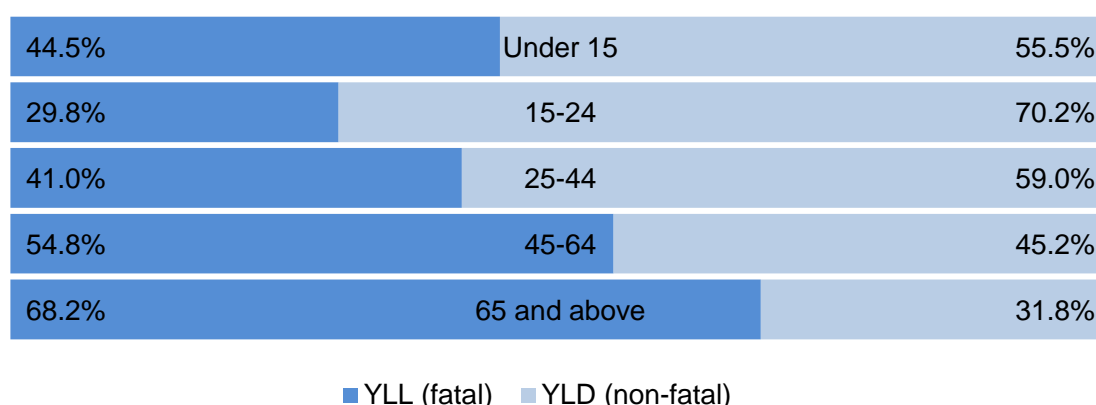
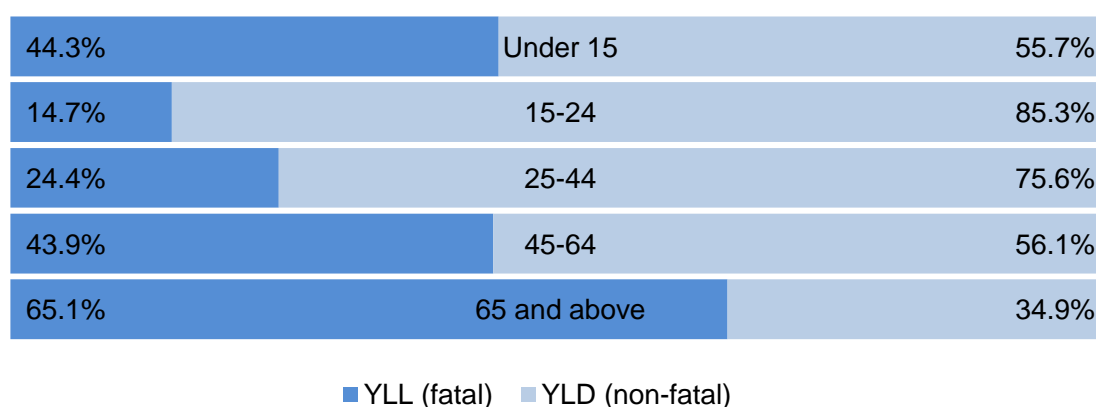


Figure 7: Percentage contribution of YLL (fatal) and YLD (non-fatal) in women by age group, Scotland 2016



Discussion

The GBD study, which describes fatal and non-fatal burden from major diseases, injuries and risk factors to health at global, national and regional levels, is the most comprehensive worldwide observational epidemiological study to date. It uses a wide range of data sources from across the world and then uses modelling techniques to estimate mortality and prevalence for every country in the world, including Scotland. The models take into account a range of country-specific factors including the mortality data, per capita income, average years of schooling, lifestyle factors and fertility/birth information.

What does our study add?

The GBD mortality estimates for Scotland are very similar to our own because of the excellent recording of death information in Scotland. However, there is no routinely available information on prevalence of disease and injury for GBD to use, which is why they use a modelling approach. Scotland has excellent health management systems that allow us to make our own estimates of prevalence based on counts of people we can identify as having different diseases or injuries, which is what we used in this study. The prevalence estimates we have produced are helping GBD further refine their prevalence estimates for Scotland.

Impact of this study

The Scottish Burden of Disease team has worked with a wide range of disease experts to produce the best estimates possible. We are clear about the impact our calculation decisions have on the final estimates (see our disease-specific technical reports for more detail). The results should be easy to understand and we have confidence in our interpretation of the results. We have used a colour scheme in our disease-specific technical reports to indicate how relevant and accurate each DALY estimate is, and to indicate where we will focus our future efforts on improving the estimates.

Limitations

We have to make assumptions about severity, the disabilities incurred and the ‘undiagnosed’ proportion of the population for each disease or injury. GBD’s published methods have been invaluable in making our calculations.

The GBD results are a very valuable source for comparison with other countries, but please be aware that some diseases that we highlight as a significant burden in Scotland do not appear as prominently in the GBD results for Scotland owing to differences in a modelling approach (GBD) compared with counting approach (Scottish Burden of Disease team). The biggest differences are for depression, anxiety disorders, alcohol dependence, diabetes and osteoarthritis. We are working with the **GBD collaborator network** and the **European Burden of Disease Network** in the ongoing mission to get more precise estimates of burden and a broader range of exposures.

How can I find out more?

Visit our web pages at www.scotpho.org.uk/comparative-health/burden-of-disease/overview to find other reports in our SBOD series, technical information and detailed results for all 132 diseases and injuries.

Contact the Scottish Burden of Disease team: nhs.healthscotland-sbod-team@nhs.net

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