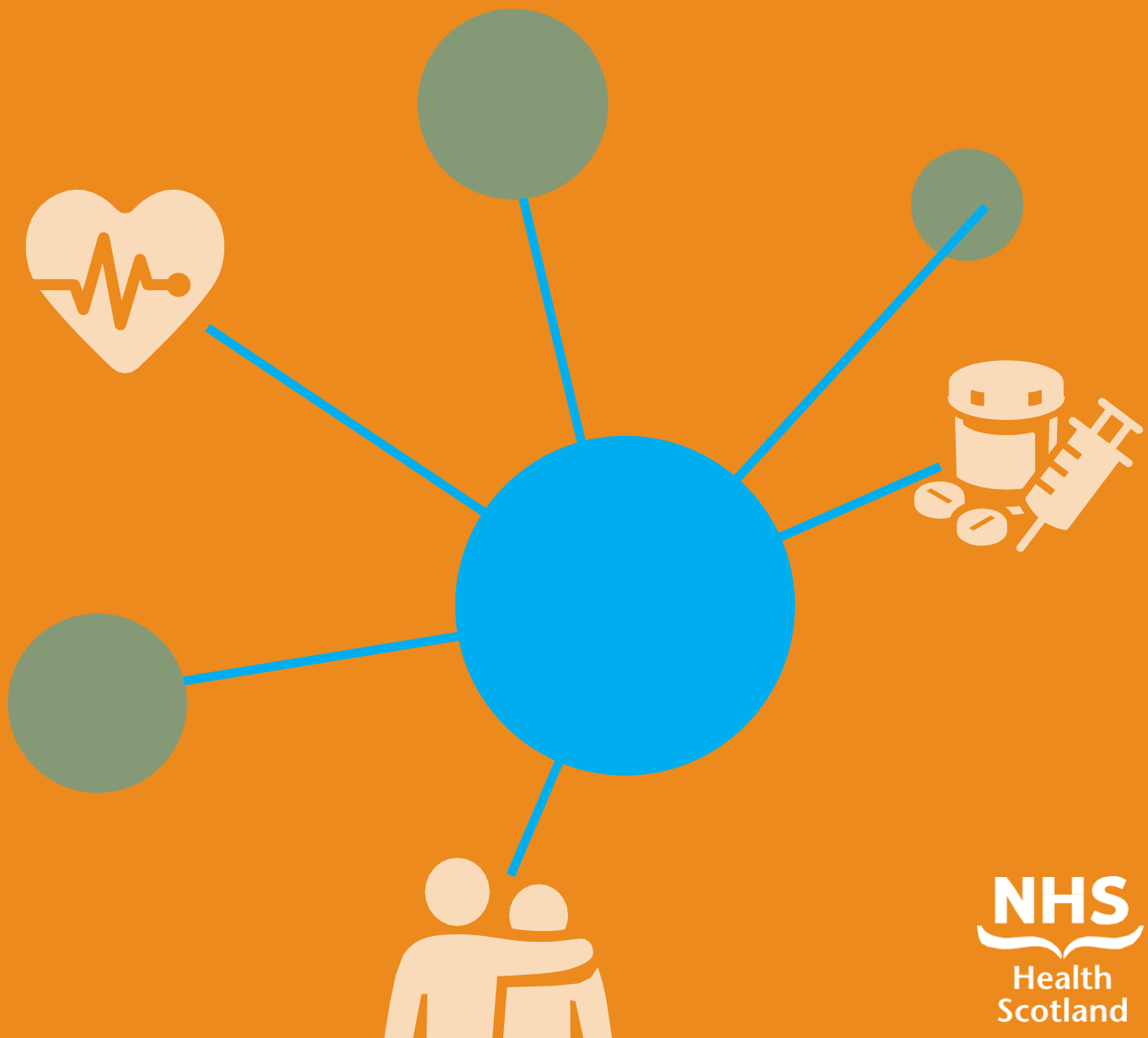



The Scottish Burden of Disease Study, 2016

Osteoarthritis technical overview



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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 osteoarthritis in SBoD.

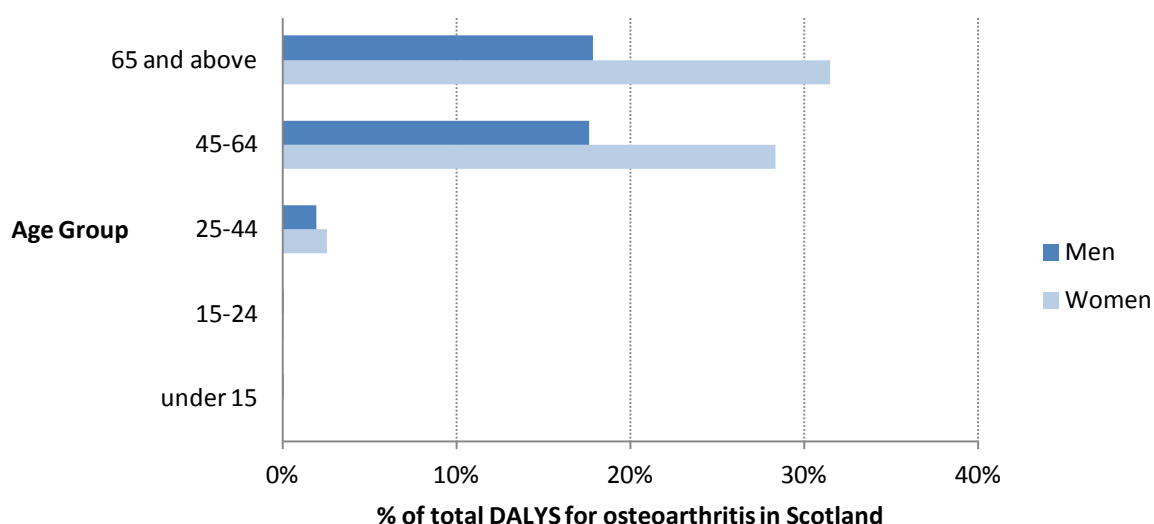
Burden of disease studies aim to estimate the difference between ideal and actual health in a country or region at a specific point in time. Individuals can suffer non-fatal health loss due to suffering disability attributable to a disease, condition or injury, or suffer fatal health loss which is early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

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 osteoarthritis

Osteoarthritis was the 19th most common cause of disease burden in Scotland in 2016, resulting in a total of approximately 20,700 DALYs. The burden of osteoarthritis is fully attributed to individuals suffering health loss due to living with osteoarthritis.

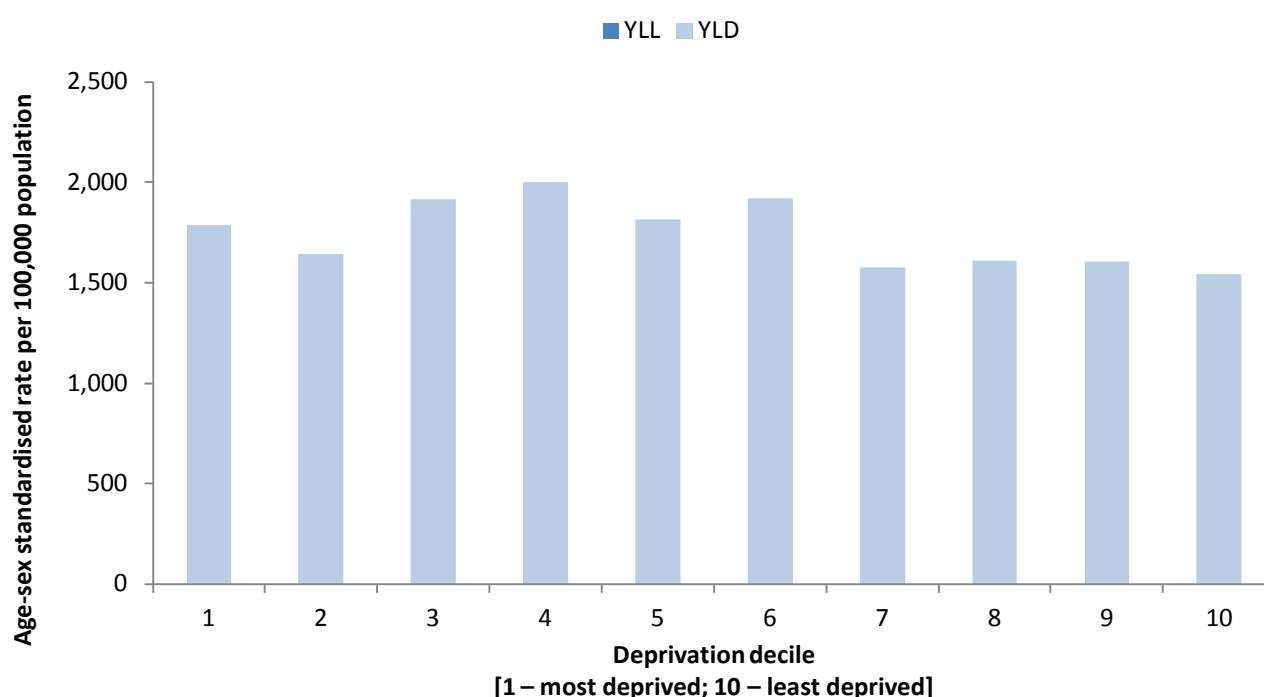
Figure 1 Percentage of total DALYs by gender and age group for osteoarthritis



Women contributed a higher proportion of the burden (62%) than men (38%). Overall, 49% of the total osteoarthritis burden was contributed by individuals aged 65 years and above, as outlined in Figure 1: women in this age group contributed a higher proportion (32%) to the total osteoarthritis burden than men (18%). Women aged 45-64 years accounted for a further 28% of the total osteoarthritis burden. Note that the burden we are describing is the absolute burden and has not been adjusted for the age/gender case-mix.

The age standardised DALY rates for osteoarthritis, by deprivation¹ decile, are shown in Figure 2. Rates varied across deprivation deciles with the highest rates found in deciles 4 and 6.

Figure 2 DALY (rates per 100,000²) of total osteoarthritis 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).

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.

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.

Years of Life Lost (YLL) due to osteoarthritis

Each single death contributes to the total YLL through calculating the difference between the age at death and the life expectancy at that age. Osteoarthritis is not regarded in itself as a valid clinical cause of death in burden of disease studies [2]. There is therefore no YLL component in the DALY for this condition; the entire burden estimated comes from non-fatal consequences of health loss due to osteoarthritis.

Years Lived with Disability (YLD) due to osteoarthritis

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 osteoarthritis in 2016, the Practice Team Information dataset (PTI) was used [3]. This dataset was collected by ISD Scotland from April 2003 to September 2013. It includes information from a nationally representative 5% sample of Scottish General Practices regarding face-to-face consultations between individuals and a member of the practice team (GPs, nurses and clinical assistants). The presence of a unique patient-identifier on the dataset allows for the grouping of consultations for each individual. The reason for each consultation was coded using Read codes [4]. The number of individuals that had a Read code specific to osteoarthritis between 1 April 2003 and 31 September 2013 were used to estimate prevalence. We used a list of Read codes developed by Keele University to identify osteoarthritis prevalent cases [5]. We did not distinguish osteoarthritis by knee, hip or any other joint. Individuals that attended their GP and consulted for osteoarthritis for the first time were counted as new (incident) cases, and we assumed that they remained a prevalent case until their point of death.

We projected the estimated annual incidence trends of osteoarthritis for the time period (2003-2013) to 2014, 2015 and 2016. The estimated incidence and mortality data was used to calculate 2016 prevalence. There is no information about the death of individuals in PTI, so adjustments to account for deaths were made using average mortality rates for each age, gender and deprivation decile in Scotland.

Using this method of identifying prevalent cases of osteoarthritis, we estimated that there were approximately 377,000 individuals in the Scottish population living with osteoarthritis in 2016.

Severity distribution and disability weights

The levels of severity and disability due to osteoarthritis in Scotland were based on the specifications of the Global Burden of Disease (GBD) 2016 study [6]. 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, and injury [7]. The severity distributions and disability weights for osteoarthritis are outlined in Table 1.

Once the severity of osteoarthritis and associated disability were taken into account, individuals were estimated to be suffering approximately 20,700 YLDs due to osteoarthritis in Scotland in 2016.

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

Severity level	Description	% of individuals	Disability weight
Mild	Has pain in the leg, which causes some difficulty running, walking long distances, and getting up and down.	54	0.023
Moderate	Has moderate pain in the leg, which makes the person limp, and causes some difficulty walking, standing, lifting and carrying heavy things, getting up and down and sleeping.	33	0.079
Severe	Has severe pain in the leg, which makes the person limp and causes a lot of difficulty walking, standing, lifting and carrying heavy things, getting up and down, and sleeping.	13	0.165

Data quality

In order to provide a measure of the degree of accuracy³ and relevance⁴ 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.

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

³ How precise, unbiased or certain the estimate is.

⁴ Do we measure the thing we want to measure?

There are no national registries available for osteoarthritis; hence we used primary care data. However, while GPs are likely to be the first point of contact for osteoarthritis problems, their recording and diagnosis in PTI may not be accurate. Additionally, PTI is a sample of the population in contact with primary care services. We assumed that osteoarthritis is a chronic disease, so once somebody is diagnosed s/he will be a prevalent case until the point of death. However, because PTI does not include information about when a person dies we have estimated when that happens based on national averages, adding another layer of uncertainty to our prevalence estimates. Finally we have not removed individuals who have a knee or hip replacement from our prevalent population.

We estimate a prevalence of approximately 377,000 individuals with osteoarthritis (knee and hip) in Scotland. The Global Burden of Disease (GBD) 2016 study estimated a prevalence of approximately 434,000 individuals in the same time period [8]. Arthritis Research UK estimates a prevalence of 420,000 individuals for osteoarthritis of the knee and 265,000 for osteoarthritis of the hip [9]. This estimate is obtained by modelling the osteoarthritis cases⁵ in the English Longitudinal Study of Ageing using socio-demographic, lifestyle and other factors from the Scottish Health Survey and extrapolating the results to the Scottish population [10].

The absences of death information in primary care data, lack of adjustment for hip and knee replacements, and the difficulty in diagnosing osteoarthritis in primary care settings are reasons to be moderately cautious about our estimates.

What next to improve estimates for osteoarthritis?

Future work on the SBoD study will attempt to refine the estimates of prevalence. This work will include reviewing the coding and recording of osteoarthritis 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 our estimates of the burden of disease in Scotland [11]. 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. Additionally, we will consider changes in the burden of osteoarthritis after taking into account the improvement in health experienced by those undergoing hip and knee replacements.

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.

⁵ Prevalent cases in the English Longitudinal Study of Ageing are those reporting that the doctor has diagnosed them as having osteoarthritis

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