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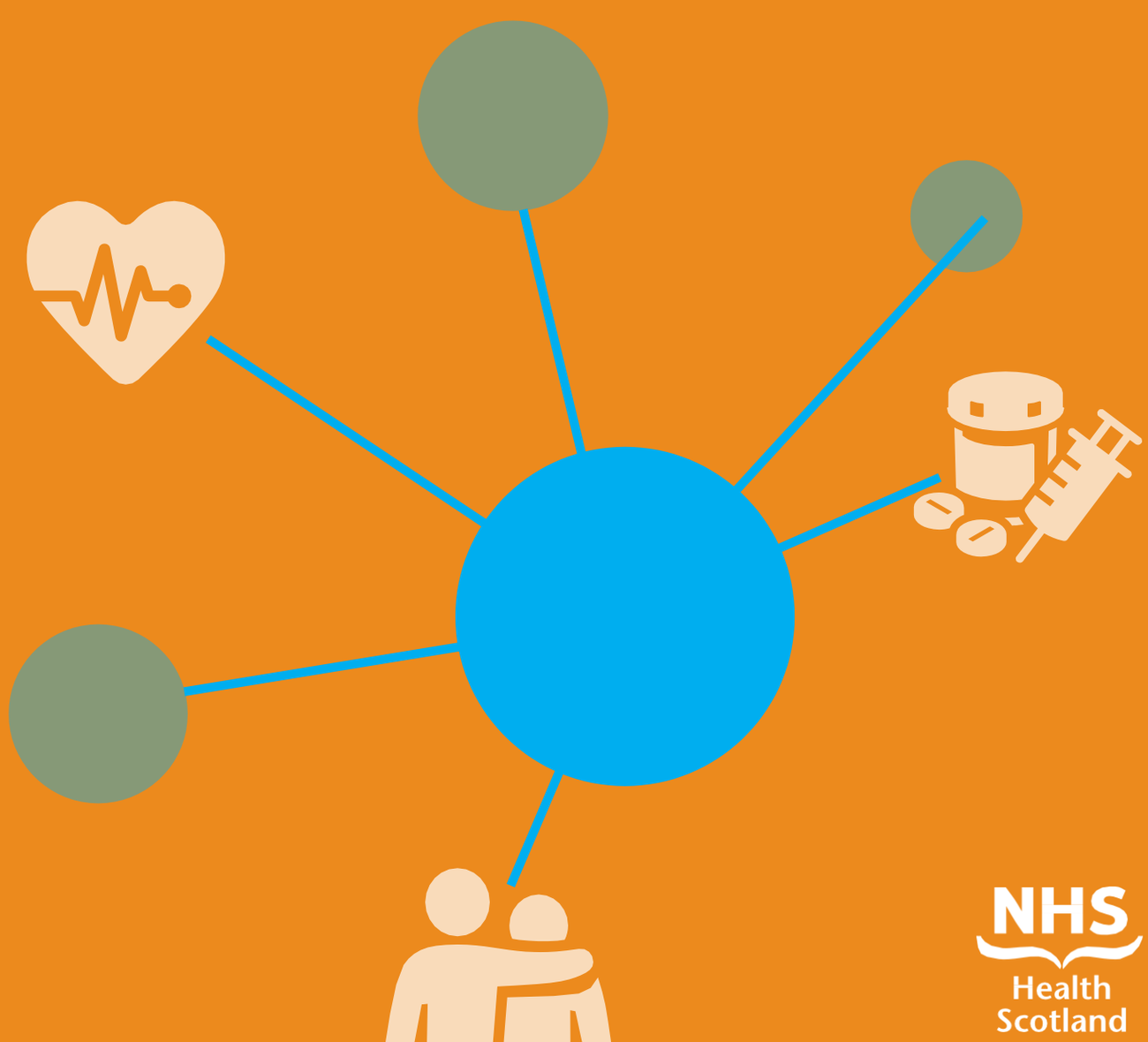
The Scottish Burden of Disease Study, 2016

Neck and lower back pain technical overview



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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 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 neck and lower back pain (N&LBP) in SBoD.

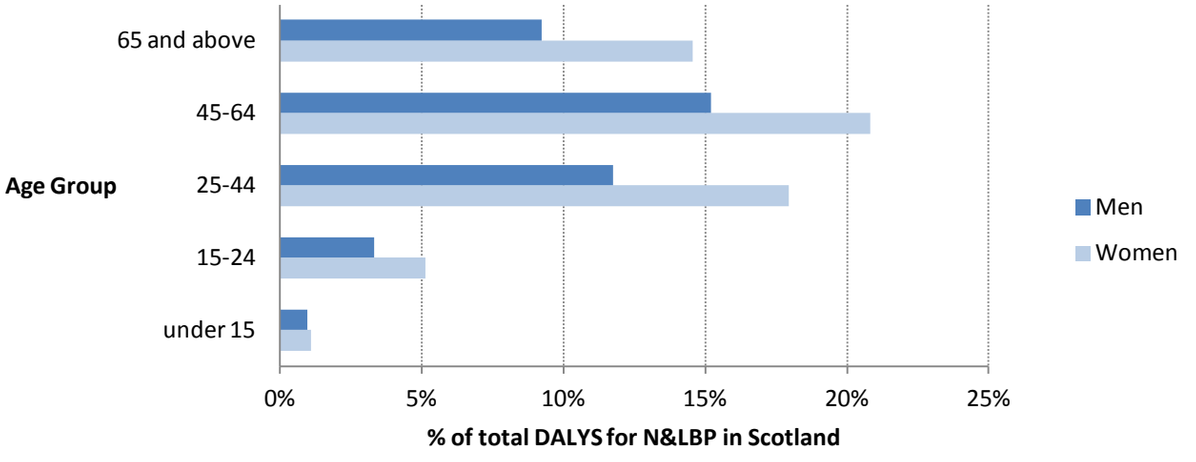
Burden of disease studies aim to estimate the difference between ideal and actual health in a country or region at a specific point in time. Individuals can suffer non-fatal health loss due to suffering disability attributable to a disease or injury, or suffer fatal health loss which is early death due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

Neck and lower back pain (N&LBP) was the second leading cause of disease burden in Scotland in 2016, resulting in a total of 67,850 DALYs. Of this total burden, 65% was due to lower back pain (LBP) and 35% to neck pain (NP)

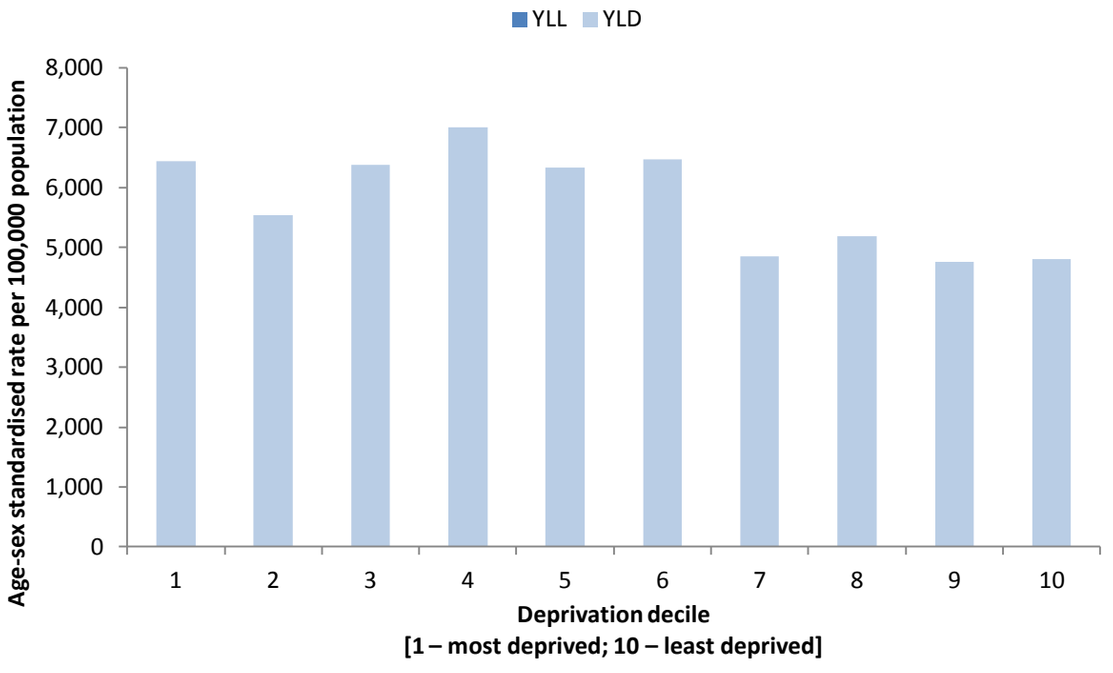
Figure 1 Percentage of total DALYs by gender and age-group for N&LBP



Women contributed a higher proportion of the burden (60%) than men (40%). Overall, 65% of the total N&LBP burden was contributed by individuals aged 25 to 64years, 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.

The age standardised DALY rates, by deprivation[1] decile for N&LBP are shown in Figure 2. Rates are fairly consistent across the deciles however deciles 7 to decile 10 have a slightly lower rate than those in deciles 1 to 6.

Figure 2 DALYs (rates per 100,000[2]) of total N&LBP burden by deprivation 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.

[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.

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) due to neck and lower back pain

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

Years Lived with Disability (YLD) due to neck and lower back pain

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:

Estimating the number of individuals suffering disability

To estimate prevalent cases of N&LBP in 2016, the Practice Team Information (PTI) dataset 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 N&LBP, between 1 April 2003 and 31 September 2013, were used to estimate prevalence. Individuals were counted once per year if they attended their GP and consulted for either neck or lower back pain. Neck and lower back pain were treated separately, so the same individual could contribute to both the prevalence estimate of NP and LBP. The burden of suffering both N&LBP is considered to be smaller than the sum of either single burden and there is a later adjustment to avoid double counting in the DALY estimate.

We used a list of Read codes developed by Keele University to identify N&LBP prevalent cases [5]. We used the average number of individuals consulting for N&LBP per year, for the time period covered by PTI (2003-2013) to estimate the number of prevalent cases in 2014, 2015, and 2016.

We estimated that there were approximately 77,000 individuals with NP and 242,000 individuals with LBP consulting with their GP practice in Scotland in 2016.

Severity distribution and disability weights

The levels of severity and disability due to N&LBP 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 have been developed by the GBD study through surveys of the general public [7] and take into account the consequences of each disease and injury. The severity distributions and disability weights for N&LBP are shown in Table 1 and Table 2.

We made two important assumptions when applying the severity distributions in Table 1 and Table 2 to estimate the burden using our prevalent count:

1. We assumed that mild cases of N&LBP are not consulting their GP practice. To consider these cases we uplifted our prevalence count by applying a factor of 1.57 and 3.05 to LBP and NP, respectively[3]. If some mild cases were consulting their GP Practice then we will have over-estimated the burden of N&LBP in Scotland.
2. We assumed that the ratio between cases of LBP with and without leg pain is approximately 1:2. This ratio is based on the worldwide prevalence reported by the GBD 2016 study [6] for LBP with and without leg pain. If we have a higher proportion of cases with leg pain then we will have under-estimated the burden on N&LBP in Scotland.

The uplift factors were applied to our prevalence estimates from the PTI dataset to obtain a total prevalence of NP and LBP, including mild cases, of 235,000 and 380,000, respectively. LBP prevalence was then split into cases with and without leg pain using the ratio 1:4. When the severity distributions and disability weights were then applied, we estimated a total of 60,100 YLD due to lower back pain and 34,100 YLD due to neck pain. Finally, these estimates were adjusted to avoid double counting the disability associated with suffering both N&LBP[4]. Once all these inputs were taken into account, individuals were estimated to be suffering approximately 67,850 YLD in 2016 due to living with N&LBP.

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[3] The uplift factor comes from the % of mild cases in:
NP : $(1-0.69)^{-1} = 3.2$ where .69 is the proportion of mild cases in GBD
LBP: $(1-(4x0.38/5 + 0.27/5))^{-1} = 1.55$ where .38 and .27 are the proportions of mild cases in GBD

[4] In fact, we adjust for the disability associated with multiple diseases. We refer to this method as comorbidity adjustment and explained in our technical paper [1]

Table 1 Description and allocation to severity levels for lower back pain (with and without leg pain) with corresponding disability weight

Severity level	Description	Disability weight	% of individuals
Mild low back pain without leg pain	has mild back pain, which causes some difficulty dressing, standing, and lifting things.	0.02	41.1%
Moderate low back pain without leg pain	has moderate back pain, which causes difficulty dressing, sitting, standing, walking, and lifting things.	0.054	34.8%
Severe low back pain without leg pain	has severe back pain, which causes difficulty dressing, sitting, standing, walking, and lifting things. The person sleeps poorly and feels worried.	0.272	10.4%
Most severe low back pain without leg pain	has constant back pain, which causes difficulty dressing, sitting, standing, walking, and lifting things. The person sleeps poorly, is worried, and has lost some enjoyment in life.	0.372	13.8%
			100%
Mild low back pain with leg pain	(combined DW)	0.02	27%
Moderate low back pain with leg pain	(combined DW)	0.054	36%
Severe low back pain with leg pain	has severe back and leg pain, which causes difficulty dressing, sitting, standing, walking, and lifting things. The person sleeps poorly and feels worried.	0.325	14%
Most severe low back pain with leg pain	has constant back and leg pain, which causes difficulty dressing, sitting, standing, walking, and lifting things. The person sleeps poorly, is worried, and has lost some enjoyment in life.	0.384	23%
			100%

Table 2 Description and allocation to severity levels for neck pain with corresponding disability weight

Severity level	Description	% of individuals	Disability weight
Mild	Has neck pain, and has difficulty turning the head and lifting things.	67	0.053
Moderate	Has constant neck pain, and has difficulty turning the head, holding arms up, and lifting things.	12	0.114
Severe	Has severe neck pain, and difficulty turning the head and lifting things. The person gets headaches and arm pain, sleeps poorly, and feels tired and worried.	6	0.229
Most Severe	Has constant neck pain and difficulty turning the head, holding and lifting things. The person gets headaches, sleeps poorly, and feels tired and worried.	15	0.304

Data quality

In order to provide a measure of the degree of accuracy[5] and relevance[6] 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.

[5] How precise, unbiased or certain the estimate is.
[6] 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 these criteria, the estimates of burden of N&LBP are deemed to have 

uncertainties over the accuracy and relevance.

While GPs are likely to be the first point of contact for N&LBP problems, their recording and diagnosis in the PTI database may not be complete or fully accurate. Additionally, the PTI dataset is a five per cent sample of GP practices, where data collection terminated in 2013. We assumed duration of one year for N&LBP, and considered that individuals suffer the burden of N&LBP only for the year they consult their GP. However, we don't have any evidence that this duration is adequate for the different severity levels associated with N&LBP.

We estimated a prevalence rate of 7% of the Scottish population for LBP and 4.4% for NP in 2016. The Global Burden of Disease study (GBD) estimated a prevalence of 12% for LBP and 8% for NP in Scotland in 2016 [8]. Comparisons with other recent studies in Scotland and other areas of the UK are problematic as many of these report prevalence of LBP and NP for specific age groups [9] and these studies also tended to report higher prevalence estimates.

Despite SBoD estimating a lower prevalence count than other studies, N&LBP still appears as the second highest cause of disease burden in Scotland. Burden could be over-reported even with under-reported prevalence. This is because the results are very reliant on the global severity distributions we have applied to Scotland (see Table 1 and Table 2), and on our three important assumptions: that mild cases do not consult their GP (if they do, we are over-estimating prevalence and burden), that a fifth of LBP sufferers have leg pain (if the proportion is lower we are over-estimating burden) and that all individuals suffer disability for a full year (if the duration is less for even a subset of patients, then we are over-estimating burden).

What next to improve estimates for N&LBP

Future work on the SBoD study will attempt to refine the estimates of prevalence. This work will include reviewing the coding of N&LBP and alternative national and local area datasets. The development of the Scottish Primary Care Information Resource (SPIRE) will help us to improve our estimates of the burden of disease in Scotland [10]. 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 30 July 2018).

[2] GBD 2016 Causes of Death Collaborators. Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet 2017; 390: 1151–210.

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[4] NHS Digital. Read Codes. NHS Digital, Available from: URL: https://digital.nhs.uk/article/1104/Read-Codes (Accessed 30 July 2018).

[5] The copyright of the Morbidity Definitions/Code Lists (©2014) used in this 'disease briefing' is owned by Keele University, the development of which was supported by the Primary Care Research Consortium. The SBoD team would like to acknowledge Keele University's Prognosis and Consultation Epidemiology Research Group who have given us permission to utilise the Morbidity Definitions/Code Lists (©2014).

[6] GBD 2016 Disease and Injury Incidence and Prevalence Collaborators Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet, 2017 390, 1211-1259.

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