# Appendix B YLD worksheet example: Dementia

Appendices B and C give two examples of YLD worksheets. This appendix contains the worksheet for dementia. Appendix C contains the woksheet for stroke. These worksheets are provided to give the reader a better understanding of the data and methods used to estimate YLD for each disease and injury. Readers interested in obtaining other worksheets should contact the Australian Institute of Health and Welfare (contact details on page iv).

## YLD worksheet: Dementia

**REGION:** **Australia**

**Code:** **K1**

**1. Case definition and sequelae**

| Disease category | Sequelae | Definition |
|---|---|---|
| Dementia | Mild | Significant impairment of daily activities only |
| | Moderate | Independent living is not possible without limited supervision |
| | Severe | Permanent supervision required |

**2. Disease weights**

| Sequelae | Weight | Comment |
|---|---|---|
| Mild | 0.270 | Dutch weight |
| Moderate | 0.630 | Dutch weight |
| Severe | 0.940 | Dutch weight |

**3. Mortality data for Alzheimer's disease and other dementias**

| | 0–4 | 5–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **Number of deaths** | | | | | | | | | | |
| Males | 5 | 4 | 0 | 1 | 0 | 2 | 20 | 158 | 1,114 | 1,305 |
| Females | 3 | 2 | 1 | 2 | 1 | 3 | 22 | 142 | 2,416 | 2,593 |
| **Deaths per 100,000** | | | | | | | | | | |
| Males | 0.8 | 0.3 | 0.0 | 0.1 | 0.0 | 0.2 | 2.6 | 25.8 | 322.3 | 14.3 |
| Females | 0.5 | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 | 2.9 | 20.8 | 430.0 | 28.3 |

4. Over 100 studies have been reported from throughout the world to estimate the prevalence of dementia in general population samples, including Australian studies (see Henderson & Jorm 1998). There have now been three age-specific prevalence meta-analyses. Jorm et al. (1987) used data from 22 studies from throughout the world and found a consistent trend for prevalence to double with every 5.1 years of age. The exponential rise was somewhat steeper for Alzheimer's disease (doubling every 4.5 years of age) than for vascular dementia (doubling every 5.3 years of age). Hofman et al. (1991) pooled data from 12 European studies carried out between 1980 and 1990. This meta-analysis differed from the one by Jorm et al. (1987) in that it excluded non-European and older studies.

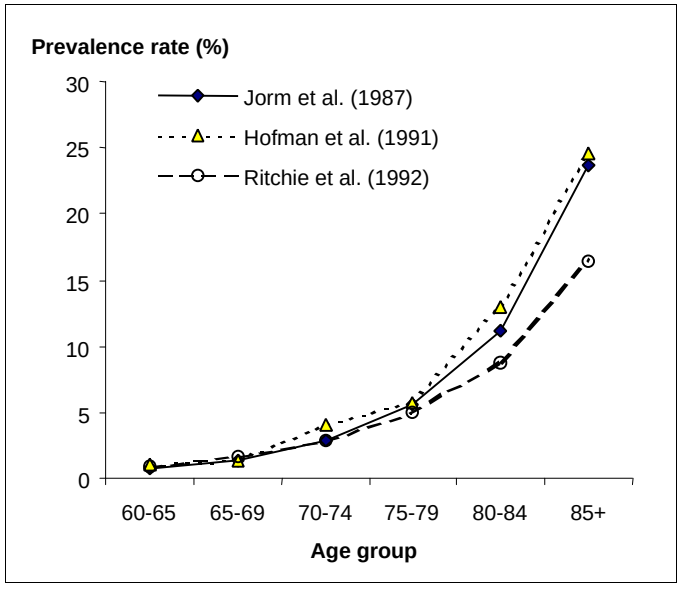
Nevertheless, as shown in Table 1, the estimated prevalence rates are strikingly similar to the ones derived from the earlier meta-analysis.

The third meta-analysis, Ritchie et al. (1992), used data from the 3 studies which had been carried out since 1980 and which used DSM-III diagnostic criteria for dementia. By restricting the studies to those that used the same diagnostic criteria, the authors found much less variability in the prevalence rates in the upper age ranges than had the other two meta-analyses. However, the number of studies included was only small. The estimated prevalence rates from Ritchie et. al. (1992) are also shown in the following table.

**Prevalence rates of dementia from age-specific prevalence meta-analyses**

| Age groups | Prevalence rates from Jorm et al. (1987) | Prevalence rates from Hofman et al. (1991) | Prevalence rates from Ritchie et al. (1992) |
|---|---|---|---|
| 60–65 | 0.7 | 1 | 0.9 |
| 65–69 | 1.4 | 1.4 | 1.6 |
| 70–74 | 2.8 | 4.1 | 2.8 |
| 75–79 | 5.6 | 5.7 | 4.9 |
| 80–84 | 11.1 | 13 | 8.7 |
| 85+ | 23.6 | 24.5 | 16.4 |

*Source:* Henderson & Jorm 1998




5. We will use the Jorm et al. (1987) prevalence rates to estimate the prevalence and incidence of dementia cases in Australia. These rates have been used to produce previous Australian estimates (Jorm & Henderson 1990, 1993) and are very close to those of Hofman et al. (1991). DISMOD is used to estimate incidence rates consistent with these prevalence rates.

6. Rather than use case fatality rates chosen to match observed dementia deaths (because dementia cases may have higher relative risk of mortality from general causes), we have used survival data from a medical case register for the US city of Rochester (Schoenberg et al. 1981 quoted in Henderson & Jorm 1998). This study found that people with dementia had a poorer survival rate than others of the same age and sex and that the relative risk of mortality is greater for earlier onset cases. From the survival data quoted in Henderson and Jorm (1998), we estimate that the mortality relative risk (RR) is 1.6 for 5-year mortality after medical diagnosis and 1.8 for 10-year mortality after medical diagnosis. We use RR of 1.8 for ages up to 75 and 1.6 for ages 75+ in DISMOD to estimate incidence and duration of dementia.

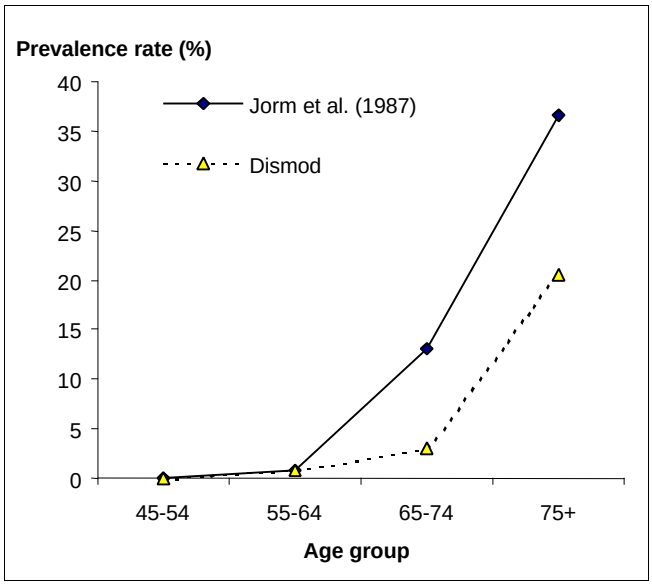
7. Dementia is rare below the age of 60. Nevertheless, this younger group is an important one to consider because they have somewhat different service needs. While the prevalence of dementia in older people is best estimated by community surveys, this method is not suitable for rare disorders because of the very large sample that would be required. For younger people, we must rely on counting cases which have come to medical attention. No studies of the prevalence of dementia in

younger persons have been carried out in Australia, so we must rely on overseas data. Henderson and Jorm (1998) quote prevalence rates for dementia below age 60 from a medical case register in Rochester in the United States (Kokmen et al. 1989). These are used to estimate approximate incidence rates in DISMOD assuming mortality RR 1.6.

8. Disability weights are derived from two Dutch studies; Barendregt and Bonneux (1998) give the prevalence of minimal (13.8%), mild (41.3%), moderate (30.0%) and severe dementia (15.0%) based on the Clinical Dementia Rating scores amongst people over 55 in a community-based, prospective study of degenerative diseases. At the Erasmus University in Rotterdam, new disability weights were generated using the person trade-off method of the Global Burden of Disease study with a description in EuroQol terms of each disability (Stouthard et al. 1997). Separate disability weights are given for mild dementia (only significant impairment of daily activities): 0.27; moderate dementia (independent living is not possible without limited supervision): 0.63; and severe dementia (permanent supervision required): 0.94. Because the prevalence meta-analysis did not include 'minimal severity' dementia, we use the relative prevalence of mild, moderate and severe dementia from Barendregt and Bonneux (1998) to calculate an 'average' disability weight.

9. Combining the prevalence figures with the above disability weights gives an average disability weight of:

$$0.479 * 0.27 + 0.348 * 0.63 + 0.174 * 0.94 = 0.512$$




10. Jorm and Jolley (1998) have carried out a meta-analysis of incidence of dementia. These are based on much fewer studies than the prevalence meta-analyses.

Estimated incidence rates for mild+ dementia in Europe are substantially higher than those estimated here from the prevalence studies. If the same mortality RR is assumed in DISMOD as above, the prevalence rates resulting from the European incidence rates for mild+ dementia reach 505 at age 85+. If the mortality RR is varied to achieve consistency between the incidence and prevalence rates from meta-analyses, the average survival with dementia has to drop to under 2 years.

Jorm and Jolley included studies with a variety of diagnostic criteria in their analysis. Those that used DSM-III criteria had somewhat lower incidence rates, but Jorm and Jolley did not give separate incidence estimates based on these in their paper. We base the YLD estimates below on the incidence rates derived from the prevalence meta-analysis of Jorm et al. (1987).

### Calculation of YLD for Australia 1996

| Australia | Population ('00,000) | Incidence | Incidence per 100,000 | Age at onset | Duration | Disability weight | YLDs | YLD per 100,000 | Undiscounted YLDs | Undiscounted YLD per 100,000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | | | | |
| 0 –4 | 6.66 | 0 | 0 | 2.5 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 5 –14 | 13.39 | 0 | 0 | 10 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 15 –24 | 13.64 | 0 | 0 | 20 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 25 –34 | 14.31 | 0 | 0 | 30 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 35 –44 | 14.03 | 0 | 0 | 40 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 45 –54 | 11.72 | 117 | 10 | 50 | 23.7 | 0.512 | 1,017 | 87 | 1,421 | |
| 55 –64 | 7.74 | 665 | 86 | 59.9 | 14.5 | 0.512 | 4,002 | 517 | 4,936 | |
| 65 –74 | 6.14 | 1,828 | 298 | 69.8 | 9.2 | 0.512 | 7,520 | 1,226 | 8,606 | |
| 75+ | 3.46 | 6,918 | 2,001 | 80.7 | 3.8 | 0.512 | 12,712 | 3,677 | 13,450 | |
| **All ages** | **91.08** | **9,529** | **105** | **76.8** | **5.8** | **0.51** | **25,251** | **277** | **28,412** | **311.9** |
| **Females** | | | | | | | | | | |
| 0 –4 | 6.31 | 0 | 0 | 2.5 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 5 –14 | 12.75 | 0 | 0 | 10 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 15 –24 | 13.12 | 0 | 0 | 20 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 25 –34 | 14.31 | 0 | 0 | 30 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 35 –44 | 14.08 | 0 | 0 | 40 | 0.0 | 0.512 | 0 | 0 | 0 | |
| 45 –54 | 11.37 | 114 | 10 | 50 | 28.3 | 0.512 | 1,109 | 98 | 1,646 | |
| 55 –64 | 7.64 | 657 | 86 | 60 | 18.4 | 0.512 | 4,754 | 622 | 6,187 | |
| 65 –74 | 6.82 | 2,052 | 301 | 69.9 | 11.9 | 0.512 | 10,506 | 1,541 | 12,493 | |
| 75+ | 5.62 | 11,482 | 2,043 | 81.3 | 4.3 | 0.512 | 23,470 | 4,176 | 25,000 | |
| **All ages** | **92.03** | **14,305** | **155** | **78.4** | **6.2** | **0.51** | **39,840** | **433** | **45,326** | **492.5** |

### Comparison with the Global Burden of Disease estimates

| | Incidence per 100,000 | | Average duration | |
|---|---|---|---|---|
| | GBD | Australia | GBD | Australia |
| **Males** | | | | |
| 0 –4 | 5.5 | 0 | 29.5 | 0.0 |
| 5 –14 | 0.9 | 0 | 40.1 | 0.0 |
| 15 –44 | 0.9 | 0 | 31.7 | 0.0 |
| 45 –59 | 40.6 | 29 | 18.4 | 14.5 |
| 60+ | 553.5 | 674 | 6.4 | 9.3 |
| **All ages** | **93.6** | **105** | **7.5** | **5.8** |
| **Females** | | | | |
| 0 –4 | 5.5 | 0 | 31 | 0.0 |
| 5 –14 | 0.9 | 0 | 42.5 | 0.0 |
| 15 –44 | 0.9 | 0 | 34.4 | 0.0 |
| 45 –59 | 40.6 | 29 | 21.3 | 18.4 |
| 60+ | 665.2 | 853 | 7.3 | 10.8 |
| **All ages** | **120.2** | **155** | **8.1** | **6.2** |

**Comparison with EME and Mauritius**

| YLD* per 100,000 | Males | Females |
|---|---|---|
| Australia | 166.6 | 244.2 |
| Mauritius | 64.0 | 93.1 |
| EME | 236.9 | 370.0 |

| Persons | YLD/DALY (%) | DALY/100,000 |
|---|---|---|
| Australia | 73 | 485.9 |
| Mauritius | 96 | 81.4 |
| EME | 85 | 359.6 |

*Age-weighted and discounted YLD and DALYs.

### Uncertainty analysis

The main sources of uncertainty in YLD estimates for dementia arise from uncertainties in the prevalence rates, the disability weights and the severity distribution of dementia. Although there are uncertainties in the mortality relative risk assumptions used to derive incidence rates from prevalence rates using DISMOD, the YLD uncertainty is essentially dependent on the prevalence uncertainty and we based the combined uncertainty of incidence and duration on the relative uncertainty in prevalence rates.

Although Jorm et al. (1987) derived confidence intervals for their prevalence meta-analysis estimates, we have compared their prevalence estimates with those of Hofman et al. (1991), which are around 15–20% higher at some ages, and those of Ritchie et al. (1992), which are around 20% lower at most ages. We modelled the uncertainty in the prevalence rates at each age using a triangular distribution with most probably value centred on the prevalence rate estimates of Jorm et al. and upper and lower limits 30% greater and lower respectively.

Stouthard et al. (1997) provided 95% confidence intervals for the disability weights for mild moderate and severe dementia. We assume that the uncertainty in these weights is normally distributed with means and standard deviations as follows:

| Dementia severity | Disability weight | 95% confidence interval | Estimated standard error |
|---|---|---|---|
| Mild | 0.270 | (0.129; 0.418) | 0.0737 |
| Moderate | 0.630 | (0.414; 0.856) | 0.1128 |
| Severe | 0.940 | (0.927; 0.954) | 0.0069 |

There is also uncertainty in the assumed distribution of mild, moderate and severe dementia. This is based on the Clinical Dementia Rating scores amongst people over 55 in a community-based, prospective Dutch study (Barendregt & Bonneux 1998). We assume that the severity distribution in Australia is similar to that in the Netherlands and do not model further uncertainty in severity beyond that resulting from the uncertainty in the disability weights above.

Using these assumed distributions of uncertainty in prevalence rates and disability weights, we used @RISK (see Section 2.10) to carry out Latin hypercube sampling using 2000 iterations to estimate the uncertainty in the YLD estimates for males and females. Results are shown in the following Table. The relative standard errors of the YLD estimates for dementia are 13% for males and for females, and 12% for both sexes combined.

| Sex | Total YLD | 95% confidence interval | Estimated relative standard error (%) |
|---|---|---|---|
| Males | 25,251 | (20,190; 30,870) | 13 |
| Females | 39,840 | (31,550; 48,730) | 13 |
| Total | 65,091 | (52,760; 77,830) | 12 |

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