



# HealthStats NSW

## Age standardisation General information

Many health conditions which HealthStats NSW reports on happen more often in people of particular ages. Diseases such as stroke and heart disease tend to occur in older people, while attending an emergency department for acute alcohol problems is more likely with young adults than children or older adults.

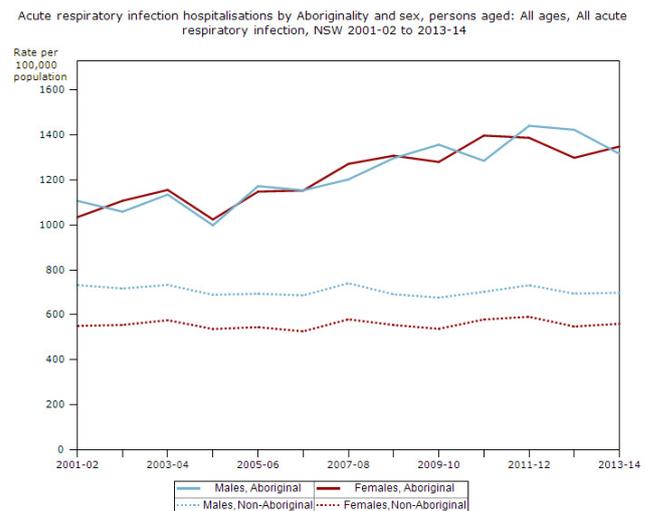
Different areas of NSW, different cultural groups, or even the population of NSW in different years may not have the same percentage of people of different ages. This complicates the interpretation of disease rates for different population groups in NSW. For example, one area may have more heart disease when compared to the whole of NSW, not because people of the same age in that area are at higher risk, but because they have an older population and so have more people at high risk than the general NSW population. The rate per head of population is called the 'crude rate' and tells you, in this example, which population overall has the biggest burden of heart disease but not whether the rate is higher than expected in the area with an older population profile.

As well as overall burden of disease, statisticians also want to ask the question, how would the disease rates in these two populations compare if we ignored age differences? In other words, how many people would we expect to have a disease in a particular area if that area had the same percentage of young and old people as some "standard" population? Age standardisation can answer that question.

HealthStats NSW uses a method called direct standardisation, which takes the age-specific rates (such as the number of people with heart disease aged 60–64 years per 1,000 people in a particular population group or area) and calculates the rate that we would expect the group we are interested in to have had if that group had the same percentages of people of different ages as some "standard" population.

Age standardisation allows us to meaningfully compare hospitalisation rates in 2001 and 2012 even though the Australian population was older in 2012 than it was in 2001, and between Aboriginal and non-Aboriginal people even though Aboriginal Australians are on average younger than non-Aboriginal Australians (Figure 1).

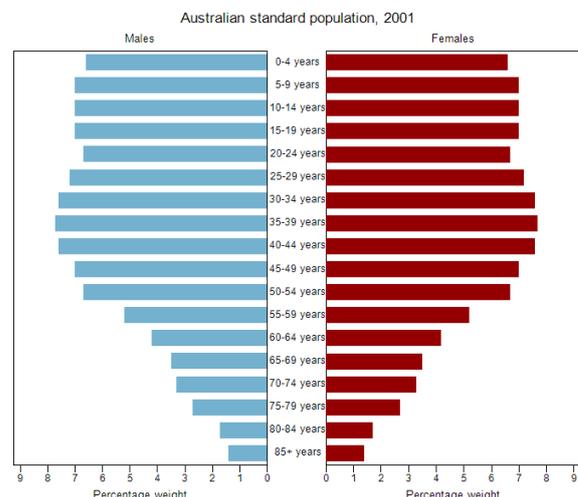
Figure 1. Example of an age-standardised indicator



HealthStats NSW uses the Australian 2001 population estimates by age group as the "standard" population. For the purpose of age standardisation we assume that there are the same number of men and women in each age group (Figure 2).

The choice of the 2001 population is based on the recommendation by the Australian Bureau of Statistics (ABS). They have shown that the year of the Australian population which is used does not have a large effect on the standardised rate.<sup>1</sup> The ABS recommends that the 2001 standard population is used until 2021, when a new Census population will become available.

Figure 2. Australian standard population weights



## Technical information

There are two frequently used kinds of age standardisation in public health statistics: direct and indirect standardisation. HealthStats NSW uses direct standardisation, as it creates comparable rates across different population groups or areas and for the same population group over time.

Direct standardisation takes the age rates in the population of interest and computes the expected rate if the population of interest had the same age distribution as the reference population we are using.

Age-specific rates are then calculated as:

$$\text{Age-specific rate}_i = \frac{(\text{special events})_i}{(\text{special population})_i}$$

These rates are then standardised by taking a weighted average across the age groups – where the weight applied is that generated from the standard population shown in Figure 2.

Using the method of Dobson et al<sup>2</sup> these standardised rates are derived from weighted sums of age-specific rates for males and females respectively. The numbers of events observed in each age group are considered to be independent and have Poisson distributions. The lower and upper bounds of the rates are given by:

$$\text{Lower Bound: } T_l = r + \sqrt{\frac{\sum_{i=1}^k w_i^2 X_i}{X}} \times (X_l - X)$$

$$\text{Upper Bound: } T_u = r + \sqrt{\frac{\sum_{i=1}^k w_i^2 X_i}{X}} \times (X_u - X)$$

Where:

$X$  is the total count of events and

$X_l, X_u$  are the exact upper and lower confidence intervals for Poisson count  $X$

$r$  is the direct standardised rate and

$w_i$  are their weights used in direct standardisation

To ensure that all age standardisation is able to effectively reference the same standard population, the ABS has released the data cube 'Standard Population for Use in Age-Standardisation Table' within Australian Demographic Statistics (Cat. no. 3101.0).<sup>1</sup>

HealthStats NSW uses the 30 June 2001 standard population for age standardisation and intends to until a new standard population becomes available after the 2021 Census. This is in line with work done with by a joint ABS–Australian Institute of Health and Welfare working group which demonstrated that the frequency of the change in the standard population resulted in negligible difference in the comparison of key indicators over time.<sup>1</sup>

### REFERENCES

1. Australian Bureau of Statistics. Standard Population for Use in Age-Standardisation Table (Cat. no. 3101.0), 2013.
2. Dobson AJ, Kuulasmaa K, Eberle E, Scherer J. Confidence intervals for weighted sums of Poisson parameters. *Stat Med* 1991; 10(3): 457-62.