

## Technical Supplement: Healthcare in Focus 2013

### Introduction

This is a supplement to the Bureau of Health Information's fourth annual performance report, *Healthcare in Focus 2013: How does NSW measure up?* The supplement describes methods and technical terms used to compute descriptive statistics and performance indicators reported. It is technical in nature, and is intended for audiences interested in the creation and analysis of health information.

### Sources of Data

To produce the report, the Bureau used the following sources of data:

- Survey results from the Commonwealth Fund International Health Policy Survey 2001, 2003, 2007, 2010, 2011 and 2013;
- The Organisation for Economic Cooperation and Development (OECD) health data library;
- NSW Health linked admitted patient, emergency department presentation and fact of death data, accessed via the Centre for Epidemiology and Evidence;
- NSW Health admitted patient (2000/01 – 2012/13), emergency presentations (2000 – 2012) and elective surgery waiting list data collections (2011-2012), accessed via the Health Information Exchange (HIE) and Waiting List Collection Online System (WLCOS);
- Australian Bureau of Statistics (ABS) mortality data for 2006 to 2011;
- Survey results from ABS Patient Experience Survey 2011-12 and 2012-13;
- Survey results from the BHI NSW Patient Survey 2011;
- Australian Institute of Health and Welfare (AIHW) expenditure data;
- Health and healthcare performance data already published by governments.

The sources of these data are indicated where appropriate.

The Bureau used SAS/STAT™ software for the statistical analysis of data published in the report [1].

## 2013 Commonwealth Fund International Health Policy Survey

Each year, the Commonwealth Fund, a philanthropic organisation in the United States, commissions an international survey to support the creation of public reports that benchmark the performance of comparable healthcare systems.

The 2013 Commonwealth Fund International Health Policy (2013 IHP) Survey was conducted by Social Science Research Solutions (SSRS). Landline and mobile telephone interviews were conducted with representative sample of more than 20,045 adults age 18 and over in Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, and the United States. In 2013, the Bureau of Health Information invested in additional sample to ensure the number of NSW participants was sufficient to compute robust estimates of indicators of performance of the NSW health system, and make statistically valid comparisons to the 10 countries participating in the survey.

Fieldwork in all countries took place between March 4 and June 5, 2013. The survey assessed public confidence in the health care system including accesses to care, cost and quality of care. SSRS have produced a comprehensive methods report that details the sample design, data collection, data processing and survey procedures used in the conduct of the survey. The following specific information on analysis has been taken from this report [2].

### Response rate and weighting the data

The response rate for the IHP 2013 varies from 11% in Norway to 33% in Switzerland (Table 1). Final samples were weighted to reflect the distribution of the adult population in each country. The characteristics and population used to calculate weights for each country are summarised in the SSRS methods report. Australian data were weighted by education, age, sex, urbanicity and region, and were weighted to the Australian Bureau of Statistics population estimates for 2011. Table 2 shows the weighted and unweighted proportions for the Australian and NSW data. The Bureau received de-identified unit record data from the survey. Bureau staff verified the estimates calculated by SSRS for the selected indicators used in the Bureau's report.

## Statistical analysis

The performance of the NSW healthcare system was reported alongside Australia and 10 other countries. One way to report differences in the estimates for each indicator across jurisdictions participating in the 2013 International Health Policy Survey is to statistically test the hypothesis that there is no difference between the NSW result and the results for other countries. The responses to each question of interest were dichotomised such that response value of interest ('Always', for example) is coded 1 and all other values are coded 0. Logistic regression was used to fit this binary variable on an explanatory variable for respondent country, with appropriate adjustment for survey weights. The SAS procedure SURVEYLOGISTIC was used for the analysis [1]. Differences between the NSW estimate and estimates of other countries, except Australia were tested at a 5% significance level using the estimates of odds ratios. The results of the analysis are available on request.

Note: Null hypotheses are never accepted. We either reject them or fail to reject them. For example, for a specific indicator, failing to reject the hypothesis of a NSW performance estimate being equal to France estimate does not mean that we accept there is no difference between NSW and France. It means that, using the available data, we are unable to reject the null hypothesis that there are not important differences in the performance of these countries.

## Australian Bureau of Statistics Patient Experience Survey

In 2012–13, the Australian Bureau of Statistics ran a nation-wide population survey of the experiences of patients using the Australian health system. The sample of 30,749 people aged 15 or over was weighted to reflect represent the estimated population aged 15 and over in private dwellings in each state and territory. The Bureau requested the weighted results of specific data items from this survey in a customised report and reported these results as they were provided. Further information on survey and analysis methods can be found in the survey's methods documentation [3].

## NSW Health Patient Survey

NSW Health conducts a regular comprehensive statewide patient experience survey. The survey collects information from patients across NSW about their experiences

with a variety of healthcare services. The survey used patient survey questionnaires developed by NRC+ Picker from the United States and was conducted in conjunction with IPSOS Social Research Institute. For this report, the Bureau used de-identified unit record data from the 2011 survey from Mental Health Inpatients (469 patients) and Mental Health Outpatients (2704 patients) respondent groups. The SAS procedure SURVEYLOGISTIC was used to compute patient population estimates using sampling and post-stratification weights provided by the survey company (IPSOS) [1], [4].

### **Linked admitted patient, emergency department presentation and fact of death data**

The Centre for Epidemiology and Evidence (CEE) at the NSW Ministry of Health maintains a data warehouse called Secure Analytics for Population Health Research and Intelligence (**SAPHaRI**) [5]. SAPHaRI holds records of hospital admissions, emergency department presentations and fact of death, each of which can be matched to a unique person identifier. The person identifier is a statistical linkage key, generated by the Centre of Health Record Linkage (CHeReL) using probabilistic record linkage methods. Further information can be found at <http://www.cherel.org.au/>.

The Bureau used these datasets to generate a suite of episode- and patient-based activity and performance indicators. The patient cohort excluded admissions to Albury Base Hospital (administrated by the Victorian Department of Human Services since July 2009) and newborns 'without qualification days' (i.e. well newborns). Well newborns were identified by ICD-10-AM codes as 'Z38.0', 'Z38.3' and 'Z38.6' recorded in any of the diagnosis fields.

### ***Number of hospitalisations by principal diagnosis***

The number of hospitalisations by principal diagnosis is reported as a count of overnight episodes that are classified according to ICD-10-AM chapter and section using the principal diagnosis recorded on the admission record.

### *Patterns of patient admissions and bed days*

Linked admitted patient data allowed the Bureau to identify how often patients are admitted to NSW hospitals and how long they stay there. Counts of overnight episodes of care recorded between 1 July 2012 and 30 June 2013 for each patient were categorised into 1, 2 and 3 or more episodes of care. The ABS estimated resident population on 31 December 2012 was used as the denominator to compute the distribution of patients by the number of times they were admitted in 2012-13.

Total bed days is a measure of total hospital use over a defined period of time and refers to the number of bed days occupied by all overnight patients admitted for episode of care during a defined period. Bed days for an episode that begins and ends within the period are calculated by the difference between the episode start date and the episode end date. Bed days for an episode that begins before the 1 July 2012 are calculated as the difference between 1 July 2013 of the period and the episode end date. Episode leave days were not subtracted from the bed days in the calculation of total bed days. Acute admissions were identified using service category field. The distribution of total bed days for overnight episodes between 1 July 2012 and 30 June 2013 was reported using the sum of bed days for patients in each of the categories of 1, 2 and 3 or more episodes of care.

### *Unplanned readmissions within 28 days*

Linked admitted patient data allowed the Bureau to identify patients who were readmitted within 28 days of a previous admission. The Bureau considered only emergency, overnight episodes for the purpose of acute, or curative, care. Episodes that ended with death or a transfer to another facility (acute or non-acute) were excluded. The period of time that elapsed between a patient's successive episodes of care was calculated by the difference between the discharge date of the former episode and admission date of the latter episode. Episodes of care for which this period was less than or equal to 28 days were flagged as episodes with an unplanned readmission within 28 days. These episodes were classified by reason for admission using the first three characters of the ICD-10-AM code recorded as the primary diagnosis.

### ***Average length of stay***

Length of stay (LOS) for an admitted patient episode was calculated as the difference in days between the episode's start and end dates. The average length of stay is the arithmetic mean of all LOS for episodes that meet the inclusion criteria. For this report, episodes included in the calculation were overnight episodes for the provision of curative (acute) care with the specific ICD-10-AM codes recorded as the principal diagnosis, as reported in Table 3.

### ***Patterns of patient presentation to emergency departments***

Linked emergency department (ED) activity data allowed the Bureau to identify how often patients visit NSW emergency departments. Counts of emergency and unplanned return visits recorded between 1 July 2011 and 30 June 2012 for each patient were categorised into 1, 2 and 3 or more visits. The ABS estimated resident population on 31 December 2011 was used as the denominator to compute the distribution of patients by the number of times they were visited an ED in financial year 2011-12. The distribution of all ED visits in financial year 2011-12 was reported using the sum of visits for patients in each of the categories of 1, 2 and 3 visits.

### ***Emergency department representations within 48 hours***

Linked emergency department activity data allowed the Bureau to identify how often patients visited NSW public hospital emergency departments with electronic data collection. The Bureau reported the proportion of ED presentations that were unplanned representations within 48 hours for each quarter between 1 July 2005 and 30 June 2012. We considered only emergency presentations and unplanned return visits. We identified an unplanned re-presentation within 48 hours by calculating the difference between the arrival time of each ED presentation and departure time of the same patient's previous ED attendance.

### ***30-day mortality rate and Risk-standardised mortality ratio (RSMR) for AMI***

The calculation of age-sex standardised 30-day mortality rate for AMI was based on a methodology used in OECD Health Data 2012. The OECD standard AMI hospitalised population is given in Table 4. Specific information regarding this methodology can be found at Health Care Quality Indicators section of OECD Health Stats [6].

The Bureau developed a 30-day risk-standardised mortality ratio (RSMR) to investigate the variation in mortality following admission for AMI after accounting for the case-mix of the hospitals. Further information regarding the statistical methods can be found in the supplement to the Bureau's *Insights into Care: 30-day mortality following hospitalisation, five clinical conditions, NSW, July 2009 – June 2012* [7].

### **Hospital activity and reporting indicators (Health Information Exchange)**

The Bureau of Health Information reports quarterly on NSW public hospital admission, emergency department and elective surgery activity and performance for all hospitals with electronic data available. The hospital level information reported here includes: the percentage of patients who did not wait for treatment, or left prior to the completion of their treatment; and the percentage of patients who began receiving treatment within the recommended time limit for their clinical urgency. The report also includes a description of the time (in weeks) that all NSW patients waited to receive for low urgency (category C) cataract, knee replacement and hip replacement elective surgery. These indicators have been calculated for financial year 2012-13 rather than a quarter, but the specifics of the analysis are the same. The details of these calculations can be found in the Bureau's Hospital Quarterly technical supplements [8], [9].

### **Organisation for Economic Co-operation and Development (OECD) data library**

The Bureau used OECD methodology to calculate a selection of indicators for NSW in order to compare NSW performance with selected OECD countries. The definitions of performance indicators used by the OECD are available at the health care quality indicators section of OECD Health Stats [6].

#### **Potential Years of Life lost (PYLL):**

Potential years of life lost (PYLL) is a summary measure of premature mortality, calculated by summing deaths at each age, multiplying that by the number of remaining years of life up to a selected age limit, which for OECD analyses, is 70 years. To obtain data for NSW and the most recent estimates for Australia for 2006-2011, the Bureau commissioned ABS to calculate PYLL standardised by age and

sex to the 2010 OECD resident population using the same methods as the OECD [6]. The ICD-10-AM codes used to classify mortality according to underlying cause of death are listed in Table 3. The OECD standard resident population used for standardisation is given in Table 5.

#### *Rates of hospitalisation for selected conditions*

The Bureau calculated rate of hospitalisation for selected conditions using OECD definition to compare NSW performance against selected OECD countries between 2001 and 2011. The cohort includes residents of NSW using NSW hospitals for overnight episodes. The morbidity codes used to calculate NSW indicators presented in this report are listed in Table 3. Table 6 gives the OECD standard resident population aged 15 or older used for age-sex standardisation of hospitalisation rates for short term complications of diabetes.

Hospitalisation rates for post-operative pulmonary embolism, deep vein thrombosis and post-operative sepsis were calculated for very specific patient populations according to the OECD definitions [6]. Table 7 gives details of the patient populations included in the calculation of these indicators.

#### *Potentially avoidable mortality*

Potentially avoidable mortality is reported by the Centre for Epidemiology and Evidence, NSW Ministry of Health using ABS mortality data and current population estimates (SAPHaRI). Details of this analysis can be found at the Health Statistics website [10].

**Table 1: sample size and response rate by country, 2013 Commonwealth Fund International Health Policy Survey 5**

<b>Country</b>	<b>Sample size</b>	<b>Response rate</b>
<b>Australia / NSW</b>	2,200	30%
<b>Canada</b>	5,412	24%
<b>France</b>	1,406	32%
<b>Germany</b>	1,125	11%
<b>Netherlands</b>	1000	23%
<b>New Zealand</b>	1,000	30%
<b>Norway</b>	1,000	11%
<b>Sweden</b>	2,400	29%
<b>Switzerland</b>	1500	33%
<b>United Kingdom (England, Scotland, Wales, and Northern Ireland)</b>	1,000	20%
<b>United States (excluding Alaska and Hawaii)</b>	2,002	22%

NOTE: The response rates for this study were calculated using American Association of Public Opinion Research's Response Rate calculator

[http://www.aapor.org/Response\\_Rates\\_An\\_Overview1.htm#Uzo4fB3BQwA](http://www.aapor.org/Response_Rates_An_Overview1.htm#Uzo4fB3BQwA)].

**Table 2: Weighted and Unweighted Sample Distributions and Population Parameters for Australia**

	<b>NSW- Unweighted</b>	<b>NSW- Weighted</b>	<b>NSW- Adults</b>	<b>Australia- Unweighted</b>	<b>Australia- Weighted</b>	<b>Australia- Adults</b>
<b>Male</b>	47%	49%	49%	48%	49%	49%
<b>Female</b>	53%	51%	51%	52%	51%	51%
<b>18-24</b>	12%	12%	12%	12%	13%	12%
<b>25-34</b>	18%	18%	18%	17%	18%	18%
<b>35-49</b>	28%	28%	27%	28%	28%	28%
<b>50-64</b>	23%	24%	24%	24%	24%	24%
<b>65+</b>	19%	18%	19%	19%	18%	18%
<b>High School or Less</b>	42%	44%	46%	43%	46%	47%
<b>Some Post- Secondary</b>	30%	30%	31%	29%	30%	31%
<b>University Degree or more</b>	25%	23%	24%	25%	22%	22%
<b>Major City</b>	65%	70%	71%	60%	70%	70%
<b>Cell Phone Only</b>	8%	24%	25%	8%	24%	25%
<b>NSW</b>	100%	100%	100%	69%	32%	32%
<b>Victoria</b>	-	-	-	12%	25%	25%
<b>Queensland</b>	-	-	-	9%	20%	20%
<b>South Australia</b>	-	-	-	3%	8%	8%
<b>Western Australia</b>	-	-	-	4%	10%	10%
<b>Tasmania</b>	-	-	-	1%	2%	2%
<b>Northern Territory</b>	-	-	-	1%	1%	1%
<b>Australian Capital</b>	-	-	-	1%	2%	2%

Territory						
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**Table 3: International Classification of Disease (ICD-10-AM) mortality codes**

Condition	Mortality	Morbidity and LOS
AMI	I21	I21-I22
Cancer	C00-C97	-
Breast cancer - Female	C50	-
Colorectal cancer	C18-C21	-
Prostate cancer - Male	C61	-
Lung cancer	C33-C34	-
Skin cancer	C43-C44	-
Heart Failure	-	I50
Complications	-	T80-T88
Cerebrovascular disease	-	I60-I69
Diabetes - short term complications	-	E10.0, E10.1, E11.0, E11.1, E13.0, E13.1, E14.0, E14.1
COPD	-	J40-J44
Asthma	-	J45-J46
Gonarthrosis	-	M17
Coxarthrosis	-	M16
Pneumonia		J12-J18

**Table 4: OECD standard hospitalised AMI population 2010 [6]**

Age group	Male	Female	Total
45–49	74,148	20,572	94,720
50–54	108,762	29,478	138,240
55–59	127,052	38,458	165,511
60–64	136,650	51,020	187,670
65–69	125,408	58,289	183,697
70–74	124,159	71,511	195,670
75–79	113,769	85,892	199,661
80–84	95,557	95,372	190,929
85+	83,829	132,234	216,063
Total	989,333	582,826	1,572,160

**Table 5: OECD standard resident population (distribution) 2010 [6]**

<b>Age (years)</b>	<b>Population</b>
0	1.28
1–4	5.04
5–9	6.16
10–14	6.20
15–19	6.62
20–24	6.77
25–29	7.01
30–34	6.94
35–39	7.17
40–44	7.10
45–49	7.11
50–54	6.60
55–59	5.98
60–64	5.40
65–69	4.21
70–74	3.58
75–79	2.88
80–84	2.13
85+	1.82
<b>TOTAL</b>	<b>100.00</b>

**Table 6: OECD standard resident population 2005 [6]**

<b>Age group</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
15-19	40,625,795	38,773,417	79,399,212
20-24	41,743,145	40,258,194	82,001,339
25-29	41,941,848	40,948,668	82,890,516
30-34	43,389,484	42,704,755	86,094,239
35-39	43,371,817	42,895,601	86,267,418
40-44	43,161,119	43,109,483	86,270,602
45-49	40,248,518	40,649,038	80,897,556
50-54	36,427,644	37,364,408	73,792,052
55-59	33,380,411	34,689,310	68,069,721
60-64	26,289,839	28,254,493	54,544,332
65-69	22,346,079	25,279,333	47,625,412
70-74	18,074,327	22,236,819	40,311,146
75-79	13,607,727	19,097,765	32,705,492
80-84	8,425,270	14,684,935	23,110,205
85+	5,282,533	12,504,426	17,786,959
<b>Total</b>	<b>458,315,556</b>	<b>483,450,645</b>	<b>941,766,201</b>

**Table 7: Detailed information about health indicators calculated by the Bureau using OECD definitions**

Indicator	ICD-10-AM code	Note
Post-operative pulmonary embolism or deep vein thrombosis, per 100,000 surgical discharges	Non-primary diagnosis of I26.0,I26.9, I80.1,I80.2,I80.3, I80.8,I80.9, I82.8,I82.9	Excluding pregnancy/childbirth and puerperium episodes.  Excluding episodes with length of stay less than 48 hours.  Episodes with procedure code of “interruption of Vena Cava” are excluded.
Post-operative sepsis rate, per 100,000 <b>elective</b> surgical discharges	Non-primary diagnosis of in: A40.0,A40.1,A40.2, A40.3,A40.8,A40.9, A41.0,A41.1,A41.2, A41.3,A41.4,A41.5, A41.8,A41.9,R57.8, T81.1	Elective surgical discharge defined using emergency status field.  Excluding psychiatric hospitals.  Excluding pregnancy/childbirth and puerperium episodes and immunocompromised patients.  Excluding episodes with length of stay less than 96 hours.

## References

1. SAS Institute. The SAS System for Windows, version 9.2 Cary (NC). SAS Institute 2005. (Note: SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration)
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