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## D Constructing estimates of hospital and medical costs

Constructing cost estimates for this study has been a major challenge because:

- existing data collections are limited by inconsistent collection methods and missing information
- differences between hospitals in the types of patients treated and services provided make like-for-like comparisons difficult.

This appendix details how the Commission has sought to address the data limitations, and take account of the diversity and complexity of hospitals, by drawing on various data sources and, where necessary, incorporating adjustments to make the data more comparable. However, the Commission readily acknowledges that significant data shortcomings have limited its ability to construct fully-comparable costs. The Commission therefore stresses that the cost estimates in this report should be treated as experimental.

### D.1 National Hospital Cost Data Collection

The National Hospital Cost Data Collection (NHCDC) is a voluntary collection of public and private hospital cost and activity information that is collected each financial year. The purpose of the NHCDC is to ‘produce national cost weights for Australian Refined Diagnosis-Related Groups (AR-DRGs) and other statistics relevant for hospital service costing and planning’ (Australian Government Department of Health and Ageing (DOHA) 2008c, p.7). The first round of the NHCDC was collected in 1996-97, and the most recent round (Round 12) was collected in 2007-08.<sup>1</sup>

The collection and reporting process for the NHCDC has several steps, as outlined in box D.1. These steps ultimately result in the production of two reports — the *Cost Report* and the *Peer Group Report*.

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<sup>1</sup> Rounds 8, 9 and 10 (2003-04 to 2005-06) of the NHCDC only include data for public hospitals (DOHA 2009a).

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### Box D.1 **NHCDC collection and reporting process**

The collection and reporting process of the National Hospital Cost Data Collection (NHCDC) is as follows:

#### **Stage 1: Preparation**

The preparation for data collection is the process that is followed at the start of each new round. Collection is initially undertaken by public hospitals within each state and territory, and by private hospitals and private hospital groups.

Guidelines for the collection of data are stipulated within the *Hospital Reference Manual* which is released around August or September of the year prior to the collection period.

Participant training is generally conducted by the Australian Government Department of Health and Ageing (DOHA), and/or the relevant state or territory coordinator, between January and March of the collection year.

#### **Stage 2: Collection**

The data collection component of the costing process is undertaken in collaboration with the state and territory coordinators of public hospitals, private hospitals and private hospital groups. They undertake initial quality assurance checks before data are submitted to DOHA for further verification.

#### **Stage 3: National receipt and processing**

After the receipt of data, DOHA checks, processes and constructs the final files required to produce a national database. DOHA then produces estimates for the total hospital population based on the sample collection.

#### **Stage 4: Analysis and reporting**

Analysis and reporting of the data is finalised by the NHCDC team within DOHA. A number of reports, including the *Cost Report* and the *Peer Group Report* (for public hospitals), are then produced.

*Source:* DOHA (2008c).

In this report, the Commission has used unpublished NHCDC data from Round 12 (2007-08) to generate its cost estimates. The 2007-08 NHCDC was contributed to by 241 public hospitals and 109 private hospitals (tables D.1, D.2 and D.3). This covered 89 per cent of public acute separations and 72 per cent of private acute separations (DOHA 2009a).<sup>2</sup>

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<sup>2</sup> Separations data supplied by state and territory coordinators for the NHCDC is the source of a population estimate of 4 508 000 public-hospital separations. The AIHW (2009a) estimated that the total number of public hospital acute separations in 2007-08 was 4 462 000, implying a coverage of just over 90 per cent. Private hospital acute separations data used to calculate

Table D.1 **NHCDC sample by jurisdiction and region, 2007-08<sup>a, b</sup>**

	NSW	Vic	Qld	SA	WA	Tas, NT & ACT <sup>b</sup>	Australia
<b>Public hospitals</b>							
Major City							
No. of hospitals	41	27	14	8	11	2	103
No. of separations	960 597	882 312	412 617	244 162	298 823	76 462	2 874 973
Inner Regional							
No. of hospitals	30	17	10	10	2	4	73
No. of separations	284 773	192 251	164 273	21 797	15 671	79 147	757 912
Outer Regional							
No. of hospitals	11	5	6	17	5	8	52
No. of separations	45 734	25 022	122 029	42 299	36 840	61 665	333 589
Remote							
No. of hospitals	–	–	1	3	2	3	9
No. of separations	–	–	1 118	6 163	10 426	38 594	56 301
Very Remote							
No. of hospitals	–	–	–	1	–	3	4
No. of separations	–	–	–	1 640	–	8 172	9 812
Total							
No. of hospitals	82	49	31	39	20	20	241
No. of separations	1 291 104	1 099 585	700 037	316 061	361 760	264 040	4 032 587
<b>Private hospitals</b>							
Major City							
No. of hospitals	22	24	12	8	7	3	76
No. of separations	337 391	388 412	268 514	119 880	178 887	35 280	1 328 364
Inner Regional							
No. of hospitals	9	5	13	–	1	2	30
No. of separations	51 169	34 265	104 423	–	18 269	32 669	240 795
Outer Regional							
No. of hospitals	–	–	2	–	–	1	3
No. of separations	–	–	32 927	–	–	5 592	38 519
Remote							
No. of hospitals	–	–	–	–	–	–	–
No. of separations	–	–	–	–	–	–	–
Very Remote							
No. of hospitals	–	–	–	–	–	–	–
No. of separations	–	–	–	–	–	–	–
Total							
No. of hospitals	31	29	27	8	8	6	109
No. of separations	388 560	422 677	405 864	119 880	197 156	73 541	1 607 678

<sup>a</sup> Regions are based on ABS *Australian Standard Geographical Classification*, Cat. no. 1216.0 <sup>b</sup> Separations are not casemix adjusted. <sup>c</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. – Nil.

Source: DOHA (unpublished data).

NHCDC coverage is extracted from the Private Hospital Data Bureau collection (DOHA 2009a).

**Table D.2 NHCCD sample by jurisdiction and hospital size, 2007-08<sup>a</sup>**

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas, NT &amp; ACT<sup>b</sup></i>	<i>Australia</i>
<b>Public hospitals</b>							
Very large							
No. of hospitals	21	18	12	5	5	4	65
No. of separations	804 241	781 645	493 750	216 403	236 970	180 549	2 713 558
Large							
No. of hospitals	18	11	10	1	3	3	46
No. of separations	261 183	212 144	178 845	10 904	49 246	65 119	777 441
Medium							
No. of hospitals	15	6	2	4	6	–	33
No. of separations	130 778	56 962	13 108	35 352	59 553	–	295 753
Small							
No. of hospitals	22	5	2	10	3	1	43
No. of separations	82 647	37 253	7 740	34 965	12 886	6 035	181 526
Very small							
No. of hospitals	6	9	5	19	3	12	54
No. of separations	12 255	11 581	6 594	18 437	3 105	12 337	64 309
Total							
No. of hospitals	82	49	31	39	20	20	241
No. of separations	1 291 104	1 099 585	700 037	316 061	361 760	264 040	4 032 587
<b>Private hospitals</b>							
Very large							
No. of hospitals	8	6	8	3	4	–	29
No. of separations	213 022	184 939	233 570	73 199	159 193	–	863 923
Large							
No. of hospitals	5	7	5	2	1	3	23
No. of separations	62 148	110 889	78 008	25 723	18 269	47 774	342 811
Medium							
No. of hospitals	9	11	6	1	1	2	30
No. of separations	71 495	99 731	57 841	11 804	12 090	20 175	273 136
Small							
No. of hospitals	8	4	7	2	2	1	24
No. of separations	39 750	24 044	35 853	9 154	7 604	5 592	121 997
Very small							
No. of hospitals	1	1	1	–	–	–	3
No. of separations	2 145	3 074	592	–	–	–	5 811
Total							
No. of hospitals	31	29	27	8	8	6	109
No. of separations	388 560	422 677	405 864	119 880	197 156	73 541	1 607 678

<sup>a</sup> Hospital size defined by annual casemix-adjusted separations as follows: very large (more than 20 001), large (10 001 to 20 001), medium (5001 to 10 000), small (2001 to 5000), and very small (up to 2000). Casemix adjustment for the purpose of allocating hospitals to a size group was undertaken by DOHA using separate cost weights for public and private hospitals. The number of separations in the table above are not casemix adjusted and so may not correspond to hospital category size, which is based on casemix-adjusted separations. <sup>b</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. – Nil.

Source: DOHA (unpublished data).

**Table D.3 NHDC sample by region and hospital size, 2007-08<sup>a</sup>**

	<i>Major city</i>	<i>Inner regional</i>	<i>Outer regional</i>	<i>Remote</i>	<i>Very Remote</i>	<i>Australia</i>
<b>Public hospitals</b>						
Very large						
No. of hospitals	52	10	3	–	–	65
No. of separations	2 285 222	294 971	133 365	–	–	2 713 558
Large						
No. of hospitals	27	16	2	1	–	46
No. of separations	435 041	269 478	40 880	32 042	–	777 441
Medium						
No. of hospitals	10	13	10	–	–	33
No. of separations	96 749	106 318	92 686	–	–	295 753
Small						
No. of hospitals	8	19	12	4	–	43
No. of separations	48 991	70 554	41 141	20 840	–	181 526
Very small						
No. of hospitals	6	15	25	4	4	54
No. of separations	8 970	16 591	25 517	3 419	9 812	64 309
Total						
No. of hospitals	103	73	52	9	4	241
No. of separations	2 874 973	757 912	333 589	56 301	9 812	4 032 587
<b>Private hospitals</b>						
Very large						
No. of hospitals	29	–	–	–	–	29
No. of separations	863 923	–	–	–	–	863 923
Large						
No. of hospitals	14	8	1	–	–	23
No. of separations	207 621	113 309	21 881	–	–	342 811
Medium						
No. of hospitals	20	9	1	–	–	30
No. of separations	188 105	73 985	11 046	–	–	273 136
Small						
No. of hospitals	13	10	1	–	–	24
No. of separations	68 715	47 690	5 592	–	–	121 997
Very small						
No. of hospitals	–	3	–	–	–	3
No. of separations	–	5 811	–	–	–	5 811
Total						
No. of hospitals	76	30	3	–	–	109
No. of separations	1 328 364	240 795	38 519	–	–	1 607 678

<sup>a</sup> Regions are classified according to the Australian Standard Geographical Classification (detailed in ABS 2005). Hospital size defined by annual casemix-adjusted separations as follows: very large (more than 20 001), large (10 001 to 20 001), medium (5001 to 10 000), small (2001 to 5000), and very small (up to 2000). Casemix adjustment for the purpose of allocating hospitals to a size group was undertaken by DOHA.

<sup>b</sup> The number of separations in the table are not casemix-adjusted and may not correspond to hospital category size, which is based on casemix-adjusted separations. – Nil.

Source: DOHA (unpublished data).

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The NHCDC data provided to the Commission differ from those used in the Round 12 Cost Report (DOHA 2009a). In particular, the unpublished NHCDC data provided to the Commission by DOHA are unweighted, and so may not necessarily be representative of the broader hospital sector. In addition, some separations were excluded from the cost analysis due to small sample sizes. DRGs were excluded if there were fewer than 30 separations at a national level, or fewer than five separations in a particular jurisdiction, or if separations occurred in fewer than three hospitals.

The Commission also excluded a number of DRGs from the cost analysis, on the advice of study participants. DRGs relating to mental diseases and disorders or drug and alcohol use (those beginning with either a ‘U’ or a ‘V’) were not included because of ‘the combination of lack of robust classification systems and very different models of paying for care in different jurisdictions’ (Australian Health Service Alliance, sub. 1, p. 3). The Commission also took account of advice from the Australian Health Service Alliance (sub. 1) that the rehabilitation DRGs be excluded, due to the potential for heterogeneity. Similarly, the ‘error DRGs’ (those with the AR-DRG prefix ‘9’) were not included due to their (unknown) heterogeneity.

### **Data not included in the NHCDC**

While the NHCDC is the most useful source of hospital cost information, there are a number of cost areas for which it does not provide information.

Most notably, the NHCDC does not include costs for a large proportion of medical and diagnostics expenditure in private hospitals because these items are often billed directly to patients. Information regarding medical costs for private patients in public hospitals is also not included for this reason. The Commission has to some extent been able to adjust the data for this lack of information by including medical and imaging costs from the Hospital Casemix Protocol (HCP) dataset. This is discussed further in section D.2.

Information about capital costs is also deficient in the NHCDC. There are no data on the user cost of capital, and costing practices unique to Victoria mean that there are no depreciation costs for public hospitals in that jurisdiction. This is discussed further in section D.6.

Costs associated with blood products are also not included in the NHCDC. Similarly, teaching costs are not specifically identified, implying that either these costs are not included, or they are incorporated into other categories.

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## Inconsistencies within the NHCDC

There are a number of differences both within and between the private and public sectors that are likely to impact on the cost estimates (Tasmanian Department of Health and Human Services, sub. 37). Differences in reported costs result from factors such as different reporting practices and obligations, and admission practices.

Publicly available documentation on different reporting practices is limited. For example, there is considerable ambiguity regarding how administrative overhead costs are treated, and the extent to which they are included in the NHCDC. It is similarly unclear how teaching, training and research costs are treated.<sup>3</sup>

Another key difference in the reporting of costs between public and private sector hospitals in the NHCDC is the predominance of ‘cost modelling’ to produce cost estimates in the private sector, in comparison to ‘patient costing’ for the majority of public hospitals.

Cost modelling involves allocating aggregate costs to individual separations through the use of national utilisation averages, or service weights. Service weights are derived from individual studies designed specifically for the resource area to which they relate, and reflect the cost of intermediate resources used in each respective DRG. More than 90 per cent of private hospitals providing data to the NHCDC report cost-modelled data (DOHA 2008c).

One potential issue with cost modelling is that it can lead to a ‘systemic under-costing of high-cost activity and over-costing of low-cost activity’, due to the potential for averaging of costs within hospitals and within DRGs (Tasmanian Department of Health and Human Services, sub. 37, pp. 7–8).

In contrast, patient costing involves attributing costs directly to patients as they occur, often through the use of automated clinical information systems. DOHA (sub. 32) noted that approximately 75 per cent of public-sector cost data are patient-costed. It is worth noting that some patient-costed sites do use service weights to allocate costs for resources in various disciplines.

As well as differences in the way data are collected and reported, differing admission practices and access to hospitals lead to variation in the average costs reported across jurisdictions. For example, in public hospitals in New South Wales,

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<sup>3</sup> The Commission understands that 132 of the 241 hospitals that submitted data to Round 12 of the NHCDC separately identify teaching, training and research costs and exclude this from the analysis. Western Australian hospitals are among those that do not separately identify these costs (Department of Health, Government of Western Australia, sub. DR72).

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South Australia and the ACT, there has been a shift over recent years from admitting chemotherapy patients to treating them as non-admitted patients (AIHW 2009a). Furthermore, states and territories may differ in the extent to which certain types of services are provided in non-hospital settings, such as community health centres.

NHCDC costs relating to public hospitals in different jurisdictions are to some extent based on different costing standards due to different reporting requirements. For example, Victorian public hospital costs are compliant with the Clinical Costing Standards Association of Australia and are subsequently mapped to the NHCDC cost structure (DOHA 2009a). This results in differences in the areas of nursing, medical, on-costs and ward supplies cost buckets, as outlined in table D.4. Similarly, the NSW Government has noted that its intensive-care unit and emergency-department funding models may increase costs in those areas, while decreasing costs attributed to diagnostics and imaging (DOHA 2009a).

**Table D.4 Differences between Victoria and other jurisdictions for NHDC cost buckets**

<i>NHDC cost bucket</i>	<i>Description of Victorian data</i>
Ward medical	Includes surgical and non-surgical medical costs.
Ward nursing	In addition to nursing salaries and wages, includes the direct costs of running a ward (such as consumables and transport) and overhead costs (such as power and light, catering and cleaning). Includes 'non-ward' costs for admitted patients including Hospital in the Home, transit lounge, maternity and post-domiciliary nursing care.
Pathology	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Imaging	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Allied health	Includes similar costs to other jurisdictions (predominantly departmental salaries and wages for allied health staff).
Pharmacy	Similar across jurisdictions, including departmental salaries and wages, drugs, consumables and overhead costs.
Critical care	Similar across jurisdictions, including departmental medical and nursing salaries and wages, consumables and overhead costs for intensive-care units, neonatal intensive-care units, special-care nurseries, coronary-care units and high-dependency units.
Operating room	Similar across jurisdictions, including departmental salaries and wages, consumables (including anaesthetic drugs) and overhead costs.
Emergency departments	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Ward supplies and other overheads	Medical supplies are rolled into the clinical area where the expense is incurred, such as ward nursing or a clinical unit. Supplies are not restricted to direct departments.
Specialist procedure suites	Some specialist suites costs, such as catheterisation laboratory or bone marrow procedure rooms may be reported in the ward medical bucket.
Prostheses	Reported as prosthesis if identifiable by the health service. May be allocated to operating room bucket if not distinguished from operating room costs.
On-costs	Included directly in the department costs such as a ward or imaging department.
Hotel services	Generally distributed to other buckets directly based on activity type, as indirect costs in Victorian cost data.
Depreciation	Capital costs are not included in Victorian cost data.

*Source:* Victorian Department of Health (unpublished).

## **D.2 Hospital Casemix Protocol**

Hospital Casemix Protocol (HCP) data are collected as part of the regulation of private health insurance, and are used as the source of private medical, imaging and diagnostic costs for this study. The HCP has clinical, demographic, benefit and charge data for privately-insured admitted-patient episodes nationally from

1996-97. The HCP for 2007-08 covered 592 public hospitals and 299 private hospitals (table D.5).

It is important to note that the HCP differs from the NHCDC in that it contains amounts charged to patients and benefits paid by insurers, rather than hospital expenditure (costs).

The collection of HCP data is a two-step process involving the provision of patient information from hospitals to health insurers and then from health insurers to DOHA. In the first step, hospitals are required to provide information to health insurers within six weeks of the insured person being discharged from hospital. In the second step, health insurers are required to provide data to DOHA within twelve weeks of the insured person being discharged from hospital.

**Table D.5 Hospital Casemix Protocol descriptive statistics, 2007-08**

	<i>Units</i>	<i>Public hospitals</i>	<i>Private hospitals</i>
Separations	No.	299 122	1 874 341
Hospitals	No.	592	299
Medical item charges	\$m	190	2 340

*Source:* DOHA (unpublished data).

### **Limitations of the HCP collection**

The HCP is considered to be representative of all separations for which private health insurance is claimed. This is in contrast to the NHCDC data, which are from a voluntary sample of hospitals. HCP data relating only to those hospitals which had submitted NHCDC data was requested by the Commission, however, the data supplied to the Commission by DOHA were for the full HCP collection. This means that the cost estimates presented in this study involve combining average costs of DRGs from different populations.

Patients who did not make a private health insurance claim, including Department of Veterans' Affairs patients, are excluded from the HCP data. In 2007-08, these patients accounted for around 90 per cent of separations in public hospitals (most of whom are public patients) and 20 per cent of separations in private hospitals (AIHW 2009a). This means that any private costs associated with the provision of medical and diagnostic services for these patients are not included in the cost estimates.

A major deficiency of the HCP is that public hospitals often fail to allocate separations to individual DRGs for their private patients. In 2007-08, around 80 per cent of separations for private patients in public hospitals were classified as

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‘ungroupable’ in the HCP. In contrast, the HCP data relating to private hospitals is of a much higher quality, with only around 1 per cent of separations classified as ungroupable in 2007-08.

Medical and diagnostics costs would be understated in the Commission’s experimental cost estimates, particularly for public hospitals, if the ungroupable HCP separations were not assigned to individual DRGs. The Commission apportioned the ungroupable HCP medical and diagnostic costs across DRGs using the methods outlined in box D.2.

**Box D.2 Allocation of ungroupable HCP medical and diagnostics costs across DRGs**

A large proportion of public hospital separations in the Hospital Casemix Protocol dataset are not assigned to specific DRGs but rather are classified as ‘ungroupable’. This means that, without adjustments, the medical and diagnostics costs associated with these separations would not be included in cost estimates. ‘Ungroupable’ medical and diagnostics costs have been incorporated into cost estimates by allocating them across all DRGs in each sector, and for each jurisdiction.

Total ungroupable costs were first scaled to reflect that the NHCDC is only a sample of public hospital separations. Ungroupable costs were then allocated across DRGs on the basis of weighted separations. That is, each DRG was allocated the proportion of ungroupable costs corresponding to the relevant number of weighted separations. The number of private separations in public hospitals for each DRG was obtained from the National Hospital Morbidity Database. Because of the low quality of the public-hospital HCP data, average private medical charges from private hospital patients were then used to weight these separations.

The effect of incorporating these costs varied according to the number of ungroupable separations in the public-hospital HCP data, relative to the total number of separations in the NHCDC data, and the total amount of charges associated with ungroupable DRGs. At a national level, inclusion of the ungroupable HCP costs increased the Commission’s estimate of medical and diagnostics costs in public hospitals by \$34 per casemix-adjusted separation (table D.6). Costs increased by \$12 per casemix-adjusted separation in private hospitals.

Table D.6 **Ungroupable separations for private patients by sector, 2007-08<sup>a</sup>**

	<i>Units</i>	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas, NT &amp; ACT<sup>b</sup></i>	<i>Aust.</i>
<b>Public hospitals</b>								
Ungroupable HCP separations	'000	141	49	13	9	8	8	232
Total HCP separations	'000	144	86	14	25	9	11	299
Per cent ungroupable	%	97.9	56.3	92.3	37.2	96.6	74.9	77.6
Ungroupable HCP medical charges	\$m	102	27	6	5	5	3	150
Total HCP medical charges	\$m	104	51	6	11	5	6	190
Per cent ungroupable	%	98.5	53.6	93.4	42.0	97.4	61.4	78.8
<b>Private hospitals</b>								
Ungroupable HCP separations	'000	6	9	7	3	6	1	32
Total HCP separations	'000	474	473	397	157	197	74	1 874
Per cent ungroupable	%	1.3	1.9	1.8	1.7	2.8	1.4	1.7
Ungroupable HCP medical charges	\$m	6	6	8	3	5	1	28
Total HCP medical charges	\$m	651	582	539	194	243	91	2 340
Per cent ungroupable	%	1.0	1.0	1.4	1.3	1.9	1.1	1.2

<sup>a</sup> Ungroupable separations are those assigned the AR-DRG code 960Z. <sup>b</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: DOHA (unpublished data); Productivity Commission estimates.

### D.3 Cost components

A measure of total cost was created by combining the different costs associated with an episode of care. As discussed in section D.1, cost components within the NHCDC vary in terms of consistency and comparability, both across and within sectors. Costs are accordingly presented in five broad groupings, as set out in table D.7, in order to aid comparability.

**Table D.7 Components of total cost estimates<sup>a</sup>**

<i>Component</i>	<i>Cost bucket</i>	<i>Description</i>
<b>General hospital</b>	Ward nursing	Nursing salaries and wages in general ward areas. Ward nursing costs may also be found in other buckets that have a medical salary and wages component, such as critical care, operating rooms, specialist procedures suites, emergency departments, imaging, pathology, allied health and pharmacy.
	Non-clinical salaries	This cost bucket includes all other costs of service provision for each inpatient separation during the collection period. These costs are primarily other salaries and wages such as patient-care assistants.
	Allied health	Costs of clinical services which are delivered by allied health professionals who have direct patient contact in areas such as audiology, physiotherapy, podiatry and dietetics.
	Critical care	Covers costs incurred in both intensive care and coronary care units.
	Operating room	Costs attributed to the area of a hospital where significant surgical procedures are carried out under surgical conditions, under the supervision of qualified medical practitioners.
	Specialist procedure suites	Costs incurred in areas where diagnostic and therapeutic procedures are performed under the direction of suitably qualified medical practitioners.
	Ward supplies & other overheads	Costs for goods and services, medical and surgical supplies, ward overheads and clinical department overheads.
	On-costs	Includes cost items such as superannuation, termination payments, workers compensation and long service leave.
<b>Pharmacy</b>	Hotel services	Includes food service, linen and grocery supplies.
	Pharmacy	The cost of providing a pharmacy. This includes the purchase, production, distribution, supply and storage of drugs and clinical pharmacy services. Pharmacy costs reported in critical care, operating rooms, specialist procedures suites, emergency departments, pathology, and imaging are not included in this bucket.
<b>Emergency</b>	Emergency departments	Area of the hospital where patients who present in an unscheduled manner can be triaged, assessed and treated. These costs relate to emergency patients who are subsequently admitted.
<b>Prostheses</b>	Prostheses	Prostheses appearing on hospital accounts and costs incurred by the hospital. Prostheses acquired by patients or their doctors directly (rather than by the hospital) will not show up on hospital accounts and are not reported.
<b>Capital</b>	Depreciation	The cost of depreciation for items that are durable, that can support production for an appreciable period of time and are purchased outright or donated. Depreciation costs are sourced from the NHCDC, with the exception of public hospitals in Victoria and Queensland which were derived from data published in SCRGSP (2009).
	User cost of capital	Estimates of the opportunity cost of funds tied up in the capital used to deliver services. Derived from data published by the ABS (2008e) and SCRGSP (2009) (see section D.6).

(Continued next page)

Table D.7 (continued)

<i>Component</i>	<i>Cost bucket</i>	<i>Description</i>
<b>Medical &amp; diagnostics</b>	Ward medical	Salaries and wages of all medical officers (incl. sessional payments). Medical costs may also be found in other buckets that have a medical salary and wages component, such as critical care, operating rooms, specialist procedures suites, emergency departments, imaging, pathology, allied health and pharmacy.
	Imaging	Costs of diagnostic and therapeutic imaging. Excludes imaging costs reported in critical care, operating rooms, emergency departments, specialist procedures suites, pharmacy, and pathology.
	Pathology	Costs of diagnostic clinical laboratory testing for the diagnosis and treatment of patients. Excludes pathology costs reported in critical care, operating rooms, emergency departments, specialist procedures suites, pharmacy, and imaging.
	Medical charges	Total charge for medical and diagnostic items as presented in medical records associated with the episode of care. This component includes medical charges that are billed directly to the patient, and are sourced from HCP data.

<sup>a</sup> Cost buckets are cost categories incurred by the hospital and are drawn from the NHCDC, with the exception of the medical charges category, which is drawn from the HCP.

Source: DOHA (2008b, 2008c).

The first component — labelled ‘general hospital’ — comprises general cost items that are often under the control of a hospital.

Emergency departments and pharmacy costs are not included with ‘general hospital’ items because of significant differences between public and private sectors. Emergency departments are predominantly in the public sector, and typically involve significant fixed costs.

Pharmacy costs for private hospitals are likely to be significantly understated in the NHCDC as they are subsidised by the Australian Government under the Pharmaceutical Benefits Scheme (PBS) (Dr. John Deeble, sub. DR56; NSW Department of Health, sub. 41; DOHA, sub. 32).

The Australian Institute of Health and Welfare (AIHW 2009d) recently estimated the expected private hospital cost of pharmaceuticals. In 2005-06, pharmaceutical costs accounted for around 3.7 per cent of private hospital expenditure. If private hospitals had faced the same pharmaceutical costs as public hospitals, taking into account differences in casemix, pharmaceuticals would have accounted for 6.4 per cent of private hospital expenditure. This suggests that private hospitals have either substantially lower pharmaceutical costs, or up to 40 per cent of the pharmaceutical costs for patients in private hospitals are met by external arrangements, such as the PBS (AIHW 2009d).

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Pharmacy costs for public hospitals are also likely to be understated. For jurisdictions other than Victoria, the NHCDC cost bucket for pharmacy does not include the cost of pharmaceuticals used in critical care, operating rooms, emergency departments, pathology, imaging, and specialist procedures suites. The extent to which pharmacy costs are included in other cost buckets varies between jurisdictions, due to differences in reporting practices. For those jurisdictions that submit sufficiently detailed data (New South Wales, Queensland, South Australia, Tasmania and the Northern Territory), it is estimated that around 76 per cent of all pharmaceutical costs are captured in the pharmacy cost bucket, with 12 per cent reported under operating rooms and 8 per cent under critical care (table D.8).

Prostheses are presented separately due to the different ways in which the costs are realised in both sectors (Australian Health Services Alliance, sub. 1; Catholic Health Australia, sub. 20). Prostheses in the public sector are typically purchased from relatively restricted lists at comparatively low costs, due to the presence of bulk purchasing arrangements.

In the private sector, most prostheses are purchased by the hospital and supplied to the patient by the hospital, although the choice of prosthesis is made by the treating doctors. Benefits for prostheses are payable to hospitals by private health insurers on the basis of amounts determined by the Minister for Health and Ageing, as presented in the Prostheses List (Catholic Health Australia, sub. DR62). Where there is a gap between the benefit paid by the fund and the prosthesis charge, this is typically paid by the patient to the hospital, and so is included in the NHCDC. Study participants indicated that private sector arrangements generally involve the use of a wider range of products, often at a noticeably greater cost (section D.8).

The experimental nature of the capital cost estimates necessitates that they be presented separately. The estimation of capital costs, as required by the terms of reference for the study, has been particularly challenging because of significant data constraints. Details about these estimates are presented in section D.6.

The medical and diagnostics component contains medical, imaging and pathology costs from the NHCDC, and medical charges from the HCP. As the HCP medical charge contains both medical and diagnostic costs, it is appropriate to group them all together in the interests of comparability.

The NHCDC cost bucket for ward medical excludes medical salaries and wages reported in imaging, pathology, critical care, operating rooms, emergency departments, specialist procedures suites, allied health, and pharmacy. This means that public-patient medical costs will be understated in the Commission's estimates to the extent that the NHCDC includes medical costs in the general hospital cost

buckets (including critical care, operating rooms and specialist procedures suites), emergency departments and pharmacy costs.

Data for New South Wales, Queensland, South Australia, Tasmania and the Northern Territory suggest that around two-thirds of NHCDC medical costs are captured in the ward medical, pathology and imaging cost buckets, with the remaining medical costs being recorded in operating rooms, critical care and emergency departments (table D.8). National medical and diagnostics costs per casemix-adjusted separation would rise from \$798 to \$1065 if one-third of medical costs were recorded in operating rooms, critical care and emergency departments, and these were reallocated to the medical and diagnostics component (table D.9). Under this scenario, medical and diagnostics costs per casemix-adjusted separation for patients in public hospitals would still be \$281 less than medical and diagnostic costs experienced by patients in private hospitals — a difference of around 21 per cent.

**Table D.8 Distribution of NHCDC pharmacy and medical costs for selected patient-costed public hospitals, by cost bucket, 2007-08<sup>a</sup>**

<i>NHCDC cost bucket</i>	<i>Pharmacy costs</i>	<i>Medical salaries and wages</i>
	Per cent	Per cent
Ward medical	–	61.2
Ward nursing	–	–
Non-clinical salaries	0.1	–
Pathology	0.2	0.9
Imaging	0.5	2.6
Allied health	–	0.1
Pharmacy <sup>b</sup>	76.4	0.1
Critical care	8.2	8.2
Operating rooms	12.1	19.4
Emergency departments	2.0	7.4
Supplies and ward overheads	–	–
Specialised procedure suites	0.5	0.2
Prostheses	0.1	–
Staff on-costs	–	–
Hotel	–	–
Depreciation	–	–
<b>Total cost</b>	<b>100.0</b>	<b>100.0</b>

<sup>a</sup> Includes patient-costed data from public hospitals in NSW, NT, QLD, SA and TAS. Disaggregation of medical and pharmacy costs for other jurisdictions was not able to be obtained as they do not provide data at a sufficient level of disaggregation, or do not submit patient-costed data. <sup>b</sup> Victorian pharmacy costs are only included in the pharmacy bucket and not in other buckets. – Nil or rounded to zero.

Source: DOHA (unpublished).

**Table D.9 Public hospital medical salaries and wages included in other NHCCDC cost buckets, 2007-08**

<i>Costs per casemix-adjusted separation</i>	<i>NSW, QLD, SA, Tasmania, NT and ACT<sup>a</sup></i>	<i>Australia<sup>b</sup></i>
Diagnostics <sup>c</sup>	268	270
Ward medical	408	490
HCP medical and diagnostic charges	55	37
Medical salaries and wages included in General Hospital <sup>d</sup>	176	211
Medical salaries and wages included in Emergency <sup>d</sup>	47	56
<b>Total medical and diagnostics costs</b>	<b>953</b>	<b>1065</b>

<sup>a</sup> Percentage of medical costs included in general hospital and emergency for QLD, NSW, TAS, NT and SA (as presented in table D.8) is assumed to apply to the ACT. <sup>b</sup> Estimates are based on the assumption that the allocation of medical salaries and wages to other NHCCDC cost buckets, as presented in table D.8, is consistent across all jurisdictions. <sup>c</sup> Diagnostics costs are NHCCDC cost buckets for pathology and imaging. <sup>d</sup> Amounts calculated using proportions from table D.8. Components may not sum to total due to rounding.

Source: Productivity Commission estimates.

## D.4 Cost indicators

Two commonly-used measures of hospital costs were estimated for this study:

- cost per casemix-adjusted separation — the average cost of treating a range of different diagnoses, after taking into account differences in the complexity of required treatments (casemix adjustment)
- cost per separation — the average cost of treating a group of patients with clinically-similar diagnoses.

Clinically-similar diagnoses were defined according to the widely-accepted system of AR-DRGs (box D.3). This classification system provides a clinically-meaningful way of relating types of patients treated to required resources (DOHA 2004). Individual DRGs represent a class of patients with similar clinical conditions who require similar hospital services (AIHW 2009a; DOHA, sub. 32).

Some participants were concerned that individual DRGs are not sufficiently homogeneous to enable like-for-like comparisons (for example, Queensland Health, sub. 27; Tasmanian Department of Health and Human Services, sub. 37; Women’s and Children’s Hospitals Australasia, sub. 21). It is inevitable that any patient classification system will have some heterogeneity within individual categories, as no single patient is identical to another, and so the question is whether such heterogeneity is significant and likely to prejudice any cost comparison.

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### Box D.3 **Classifying episodes of care — Diagnosis-Related Groups**

The Diagnosis-Related Group (DRG) system is a taxonomy of hospital outputs that is used to document, apportion and control costs in hospitals. The purpose of the DRGs is to relate the mix of patients treated, or casemix, to the resource demands and associated costs experienced by a hospital. Separations are categorised on the basis of three main principles:

- clinical meaning — diagnoses within each DRG are to be clinically similar
- resource homogeneity — treatment of diagnoses within each DRG should utilise a similar type and amount of resources
- exclusivity — diagnoses should only correspond to a single DRG.

The DRG system currently used in Australia reflects local clinical practice and is referred to as Australian Refined Diagnosis-Related Groups (AR-DRGs), with the latest version (6.0) released in 2008. The NHCDC and HCP data presented in this study use AR-DRG version 5.1.

A DRG system groups episodes of patient care into categories differentiated by factors such as main diagnosis, clinical procedures, gender, age, and the presence of additional diagnoses or complications. At the highest level, episodes of care are classified into a Major Diagnostic Category (MDC). Diagnoses in each MDC correspond to a single body system or cause of disease, broadly reflecting the specialty providing care. All possible principal diagnoses in the AR-DRG classification system fall into one of 23 mutually exclusive MDCs, and into one of 665 AR-DRGs.

*Source:* Bridges, Haas and Mazevska (1999); DOHA (2004); Erlandsen (2008).

The Commission notes that factors such as patient age, severity of conditions, and the presence of comorbidities, are included in the AR-DRG system, and so are, to some extent, controlled for. The AR-DRG system has been refined over a period of more than a decade with input from national, state and territory health departments so that only patients with similar clinical conditions and resource requirements are grouped into the same DRG (DOHA 2004).

The AR-DRG system only applies to admitted patients, and so it was not possible to compare costs for other hospital services. Admitted-patient services accounted for 71 per cent of the costs incurred by overnight acute hospitals in 2007-08 (AIHW 2009a).<sup>4</sup>

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<sup>4</sup> Victoria admits patients for treatments that other jurisdictions may administer as non-admitted (outpatient) services, such as chemotherapy and dialysis, and so Victoria may account for a disproportionate share of national costs for admitted-patient services.

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The grouping of similar outputs by DRG, and casemix adjustment when comparing costs for more than one DRG, is an important step in making cost comparisons more meaningful. The details of casemix adjustment are outlined in box D.4.

**Box D.4 Cost per casemix-adjusted separation**

Casemix adjustment involves weighting the separations for each DRG by its relative complexity, and is often used to improve comparisons between different hospitals.

The complexity of an episode of care in the context of hospital costing refers to the expected resources that are to be used in treatment. The complexity of a DRG is measured by its relative cost weight — the average cost of that DRG across all relevant hospitals divided by the average cost of all DRGs.

The cost per casemix-adjusted separation is given as:

$$\frac{\text{Total expenditure}}{\sum_i \text{Separations}_i \times \text{Relative cost weight}_i}$$

where there are  $i$  number of DRGs.

The denominator in this expression is the number of casemix-adjusted separations and is used to adjust the number of separations for their relative complexity in calculating a per unit cost. Casemix adjustment can be performed at different levels of aggregation, such as by jurisdiction, region or size.

Source: AIHW (2009a).

## D.5 Tax exemptions

Public and not-for-profit private hospitals are partially exempt from paying fringe-benefits tax (FBT) and are not required to pay payroll tax. Private not-for-profit hospitals are also entitled to income tax exemptions (including capital gains tax), and goods and services tax, stamp duty and land tax concessions. As ‘deductible gift recipients’ they are entitled to receive income tax deductible gifts and tax deductible contributions (KPMG 2009). These concessions can assist public and not-for-profit private hospitals in recruiting and retaining staff (Treasury 2008a). The terms of reference for this study require the Commission to take account of FBT exemptions when comparing costs.

The FBT and payroll-tax concessions mean that the cost of offering a given level of post-tax remuneration is likely to be greater for a for-profit hospital, than for a public or not-for-profit private hospital. That is, the concessions confer a cost

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advantage on public and not-for-profit private hospitals by effectively subsidising their labour costs.

As the cost of labour faced by public and not-for-profit hospitals is reduced by the tax concessions, this is likely to distort resource allocation. Reducing the price of labour relative to capital and other inputs for public and not-for-profit private hospitals provides an incentive for them to be more labour intensive than for-profit private hospitals that are not afforded these concessions. No adjustments for this distortion have been made in this study.

The Commission has, however, sought to ensure that costs are compared on a like-for-like basis by removing the additional tax burden that for-profit hospitals, compared to public and not-for-profit private hospitals, incur due to not having access to the FBT and payroll-tax exemptions.

#### *Fringe-benefits tax exemption*

The fringe-benefits tax (FBT) exists to ensure that remuneration from employers is treated consistently, regardless of the form in which the income is received. It is paid by employers at the top marginal tax rate plus the Medicare levy (46.5 per cent).

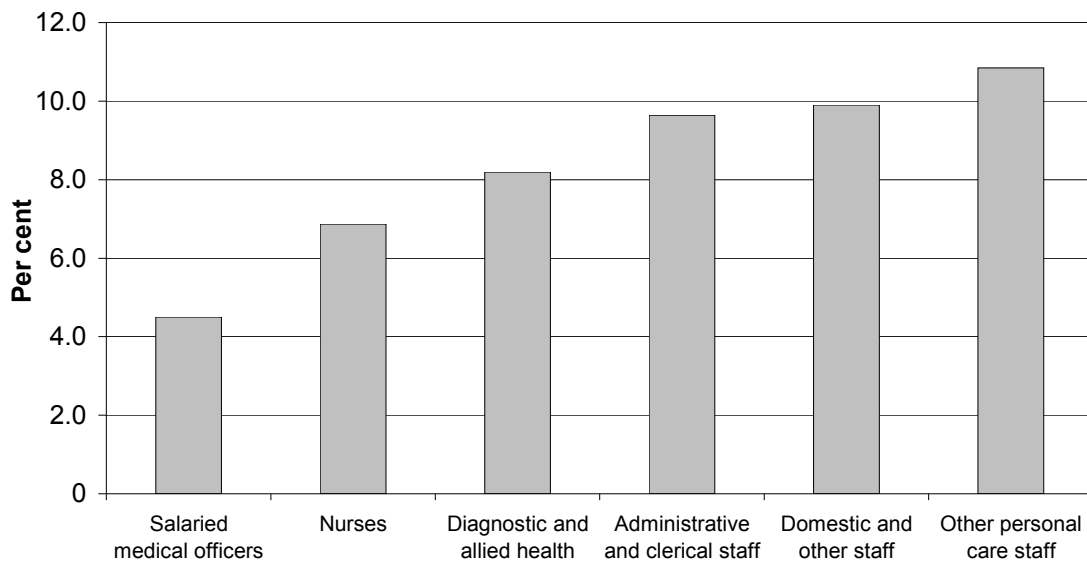
The FBT exemption for public and not-for-profit hospitals can provide them with a cost advantage that aids in recruiting and retaining staff (Treasury 2008a). Individuals working for these hospitals are able to increase their post-tax remuneration by taking some of their pay package as fringe benefits. The exemption is capped at \$17 000 per employee (ATO 2007). The cap prevents overuse, constrains the impact of the concession on competitive neutrality, and limits the foregone tax revenue to the Australian Government to \$7905 per employee (46.5 per cent of \$17 000).

However, there are a number of items that are excluded from the \$17 000 cap on the FBT exemption for public and not-for-profit hospitals. These include meal entertainment (such as a doctor's expenses on a restaurant meal at a social occasion), entertainment-facility leasing expenses and car parking. There is little information on the use of these uncapped FBT exemptions, and so the Commission has not been able to specifically adjust for them in its cost estimates.

The proportionate increase in post-tax remuneration that can be achieved by using the capped FBT exemption will depend on a worker's pre-tax salary. Based on the average salaries of different occupations, the capped FBT exemption has the potential to increase post-tax remuneration by a greater percentage for other

personal care staff compared to salaried medical officers (figure D.1). However, participants noted that the NSW Government has a policy of taking 50 per cent of the tax savings that public hospital employees in NSW would otherwise enjoy by taking part of their package as fringe benefits (for example, Mark Hanlon, sub. DR46).

Figure D.1 **Maximum effect of the capped fringe-benefits tax exemption on post-tax remuneration, by occupation<sup>a</sup>**



<sup>a</sup> Reduced tax as a percentage of average salaries of full-time equivalent staff in public acute and psychiatric hospitals. It is assumed that employees minimise their tax liabilities and realise the exemption up to the \$17 000 cap.

Source: Productivity Commission estimates.

FBT payments are included in the NHCDC on-cost bucket (DOHA 2008c). However, it is not possible to separately identify FBT in the NHCDC data. The Commission therefore had to estimate the impact of the FBT exemption indirectly.

The capped FBT concession for public and not-for-profit private hospitals is estimated to have cost the Australian Government \$270 million in foregone revenue in 2007-08 (Treasury 2008b). This was equivalent to around 1.4 per cent of the total wage bill of public and private not-for-profit hospitals in 2007-08 (AIHW 2009a, ABS 2008e).

As for-profit and not-for-profit private hospitals are not distinguished in the NHCDC, estimating and removing the 'excess' FBT incurred by for-profit hospitals required a number of adjustments. First, the amount by which the for-profit private hospital wage bill was to be reduced was estimated. This amount was then expressed as a proportion of the total wage bill of private hospitals (for-profit and

not-for-profit hospitals combined), as these hospitals are not identified separately in either the NHCDC or the HCP datasets. The cost buckets that relate specifically to wages and salaries were then reduced by this percentage.

In estimating the percentage by which the private for-profit wage bill needs to be reduced, it was assumed that use of the capped FBT exemption is the same across both public and private not-for-profit hospitals. It was also assumed that if for-profit private hospitals had access to the capped FBT exemption, they would utilise it in the same way as public and not-for-profit hospitals.

The estimated total cost of the capped FBT exemption (\$270 million in 2007-08) was first apportioned between public and private not-for-profit hospitals, according to the relative size of their total wage bills.<sup>5</sup> On this basis, around \$246 million, or about 90 per cent, of the tax benefit from the capped FBT exemption, was estimated to have gone to public hospitals, and around \$24 million — around 1.4 per cent of the total wage bill of private not-for-profit hospitals (ABS 2008e) — went to private not-for-profit hospitals (table D.10).

**Table D.10 Distribution of benefits from the capped FBT exemption by sector**

<i>Hospital type</i>	<i>Total wage expenditure<sup>a</sup></i>	<i>Proportion of foregone FBT revenue</i>
	\$m	%
<b>Private</b>		
For-profit	1 700 724	..
Not-for-profit	1 701 072	9
<b>Public</b>	16 410 900	91

<sup>a</sup> Total wage expenditure figures are from 2006-07, as private wage expenditure figures for 2007-08 are not currently available. .. Not applicable.

Source: ABS *Labour Price Index, Australia*, Cat. no. 6345.0; AIHW (2008b); Productivity Commission estimates.

If private for-profit hospitals had utilised the capped FBT exemption to the same extent as other hospitals, private for-profit hospitals would have received a tax benefit in the order of \$24 million.<sup>6</sup> This amounts to around 0.7 per cent of the total wage bill for all private hospitals, and is the factor by which private hospital labour costs were reduced to take into account the differences in access to the capped FBT

<sup>5</sup> Private hospital wage data were not available for 2007-08, so wage relativities for 2006-07 were used to apportion the 2007-08 FBT cost across public and private not-for-profit hospitals.

<sup>6</sup> This is around 1.4 per cent of the wage bill for private for-profit hospitals. This calculation assumes that the employment behaviour of private for-profit hospitals would not have changed with access to the capped FBT exemption.

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exemption. In particular, NHCDC cost buckets for ward medical, ward nursing and non-clinical salaries were reduced by 0.7 per cent for private hospitals. This averaging approach takes full account of the capped FBT disadvantage faced by the private for-profit sector by apportioning it across the entire private hospital sector.

### *Payroll taxes*

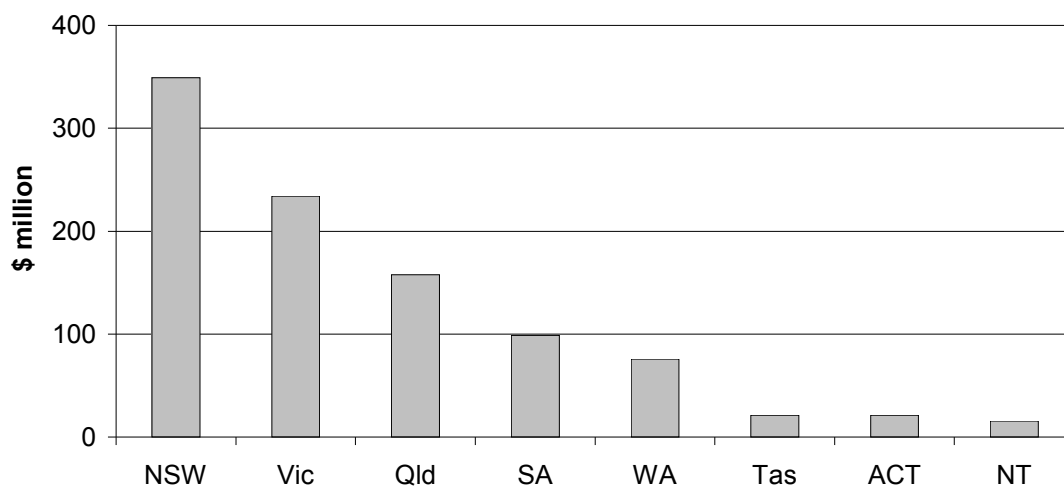
All states and territories levy a payroll tax on employers that have total wage and salary payments exceeding specified tax-free thresholds. As noted above, public and not-for-profit private hospitals are exempt from payroll tax.

The states and territories individually administer payroll taxes, so there are different tax rates and thresholds across jurisdictions. Payroll-tax rates range from 4.7 per cent in Queensland to 6.8 per cent in the ACT. The wage-bill threshold at which payroll taxes become payable range from a wage bill of \$550 000 in Victoria to \$1.5 million in the ACT.

The Commission was advised that payroll taxes are supposed to be excluded from the NHCDC data, and so the Commission did not adjust the data to reflect the different payroll-tax regimes applying to for-profit private hospitals relative to public and for-profit hospitals. It should, nevertheless, be noted that the impact of payroll-tax exemptions on labour costs is not trivial.

The payroll tax concessions represent a significant cost that is often not explicitly taken into account. As shown in figure D.2, the impact of payroll-tax exemptions on public hospitals is also likely to vary markedly between jurisdictions, depending on the tax rate applied. Across all jurisdictions, the concession is worth around \$970 million for public hospitals alone. This represents around 5.4 per cent of the total wage and salary bill for public hospitals in Australia (AIHW 2009a).

Figure D.2 **Estimated benefit to public hospitals of payroll-tax exemptions, 2007-08<sup>a</sup>**



<sup>a</sup> Based on the number of full-time equivalent employees and total wage bill for each jurisdiction.

Source: ACT Revenue Office (2009a, 2009b); AIHW (2009a); State Revenue Office (Vic) (2009a, 2009b); Office of State Revenue (Qld) (2009a, 2009b, 2009c); Office of State Revenue (NSW) (2007, 2008), Revenue SA (2008, 2009), Office of State Revenue (WA) (2007); Department of Treasury and Finance (Tas) (2008a, 2008b); Territory Revenue Office (NT) (2008a, 2008b); Productivity Commission estimates.

## D.6 Capital costs

The terms of reference require the Commission to take into account capital costs when comparing costs for clinically-similar procedures performed by public and private hospitals. Capital costs comprise two components:

- depreciation — the reduction in the value of an asset due to usage or obsolescence
- the user cost of capital (UCC) — the opportunity cost of funds tied up in the capital used to deliver services. That is, the return that could be generated if the funds tied up in the capital used to provide hospital services were employed in their next best use.

In most cases, depreciation is recorded at a DRG level in the NHCDC, and so identifying this cost has been relatively straightforward. In contrast, comparing the UCC on a like-for-like basis is difficult because it is not included in the NHCDC, and other data sources are limited by inconsistent collection methods and missing information. This reflects differences in the rationale for, and relative importance attached to, public reporting of the amount of capital used in the public, not-for-profit, and for-profit sectors.

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Where capital costs are not available in the NHCDC, the Commission has largely drawn on the methodology and data that jurisdictions have for some years contributed to for national reporting of public hospital costs under the auspices of the Steering Committee for the Review of Government Service Provision (SCRGSP). The SCRGSP (2009) — comprising representatives from the Australian, state and territory governments — reported that, in 2006-07, capital costs accounted for around 10 per cent of the average cost per casemix-adjusted separation for inpatient services at major public acute hospitals.

The SCRGSP methodology for estimating the UCC of public hospitals involves calculating the return foregone on the next best investment, estimated at a rate of 8 per cent of the value of assets (box D.5). To ensure like-for-like comparisons in this study, the Commission has used the same approach when calculating the UCC for private hospitals.

**Box D.5 SCRGSP methodology for calculating public hospital capital costs**

The SCRGSP methodology for calculating capital costs for public hospitals is as follows:

- Asset values for land, buildings and equipment, and depreciation data for buildings and equipment are provided by state and territory governments
- The user cost of capital (UCC) for each asset class in each state is calculated by multiplying the value of the jurisdiction's assets by a UCC rate (8 per cent).
- The resulting capital cost (depreciation and UCC) for each asset class is then divided by the number of casemix-adjusted separations and multiplied by an 'admitted-patient cost proportion' to obtain a capital cost per casemix-adjusted separation for admitted patients. Asset values and depreciation data for Victoria and Western Australia are only for admitted patients and thus the admitted-patient cost proportion is one for these jurisdictions.
- The next step is to calculate a total capital cost (excluding land) per casemix-adjusted separation. This is done by adding the capital cost per casemix-adjusted separation for buildings and equipment, and subtracting interest payments per separation. Land is excluded, as differences in property values obscure the differences between how well hospitals are managed. Interest payments represent a UCC, and so are subtracted to avoid double counting.

*Source:* SCRGSP (2009).

The estimation of the UCC is considerably more difficult for private hospitals compared to public hospitals, as the asset values of private hospitals are not publicly available and need to be estimated. The absence of this information presents a

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considerable obstacle in estimating comparable and robust capital costs, particularly in the private sector. As detailed below, the asset values used to estimate the UCC for private hospitals were derived from investment and depreciation data collected by the ABS (2008e). However, this data may not cover all capital investment in private hospitals. As parties other than the private hospital operator invest in hospital capital, it is likely that the value of leased assets are not fully covered in asset estimates.

NSW Department of Health (sub. 41; sub. DR64) and Dr. John Deeble (sub. DR56) favoured a different approach in which profits were used to measure the UCC for private hospitals. Using profits to measure the UCC of private hospitals is likely to be misleading because many private hospitals are run on a not-for-profit basis. As noted by Catholic Health Australia, the large number of hospitals it represents are motivated by benefits other than just profits:

Catholic hospitals also have a mission focus which is often reflected in providing a wider range of treatments, such as palliative care, than might be the case than if the hospital was purely focused on profit maximisation. It also means that some Catholic hospitals are located in geographic regions which might not necessarily be attractive to for-profit operators. (sub. 20, p. 2)

A further problem with the approach suggested by NSW Department of Health and Dr. Deeble is that it confuses profits recorded for accounting purposes with the economic concept of the UCC. Accounting profits measure the difference between revenue and the amounts paid for inputs, rather than their opportunity costs. Two companies could use identical amounts of capital — and hence have the same UCC — but record very different profits for accounting purposes because of differences in their use of debt and rented capital items.

Nevertheless, despite using a different methodology, NSW Department of Health and appear to have reached a similar conclusion to that found by the Commission. In particular, NSW Department of Health (sub. 41) estimated that the average amount of capital used per bed in public hospitals is much higher than in private hospitals (\$388 000 versus \$244 000 per bed). The Commission's experimental estimates also show that public hospitals have a higher capital cost per casemix-adjusted separation than private hospitals (chapter 5).

## **Capital costs for public hospitals**

Average depreciation costs are included in the NHCDC by DRG for all jurisdictions except Victoria. However, the data for Queensland exclude building depreciation, which accounts for the majority of depreciation in other jurisdictions.

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The depreciation values reported by the SCRGSP (2009) for Victorian and Queensland public hospitals were used to approximate average depreciation by DRG for these jurisdictions. To reflect that the NHCDC is a sample of hospitals, the reported depreciation values for Victorian and Queensland hospitals were multiplied by the percentage of public separations in the NHCDC for each jurisdiction. These total depreciation amounts were then inflated to 2007-08 levels using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c). Depreciation was apportioned across DRGs using a weighted average of the other jurisdictions' depreciation profiles, using weights were based on the jurisdiction's share of total separations.

It is unclear whether leasing and interest costs are included in the NHCDC cost buckets for depreciation and/or ward supplies and other overheads. The NHCDC Hospital Reference Manual states that costs associated with major leases are to be grouped with corporate overhead costs and included in the ward supplies and other overheads cost bucket (DOHA 2008c).<sup>7</sup> The treatment of leasing and interest-related costs is also likely to differ between sectors and jurisdictions.

The UCC for each jurisdiction was based on the 2006-07 admitted-patient UCC for buildings and equipment (minus interest payments) published by the SCRGSP (2009). To reflect the fact that the NHCDC only represents a sample of all hospital episodes, the UCC figure for each jurisdiction was multiplied by the percentage of that jurisdiction's public-hospital separations that were included in the NHCDC. These UCC figures were then inflated to 2007-08 values using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c). To obtain an average UCC by DRG for each jurisdiction, the estimated total UCC was allocated according to the proportion of a jurisdiction's public hospital depreciation attributed to each DRG.

The reported public hospital asset values on which the UCC is derived suggest that Australian public hospitals had assets worth approximately \$21.9 billion in 2007-08. NSW Department of Health (sub. 41) noted that this figure is consistent with work carried out by Dr. Deeble for the governments of Victoria, Queensland and South Australia over the last ten years. Nevertheless, NSW Department of Health (sub. 41, p. 3) observed that 'nobody knows exactly how much capital is currently used by the public hospitals'. This is partly due to inconsistent accounting practices regarding depreciation and the valuation of assets among governments. This might explain why the public hospital assets that Victoria reports to the SCRGSP seem to be an underestimate when compared to those of New South Wales and Queensland (figure D.3).

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<sup>7</sup> These corporate costs are allocated across different DRGs on the basis of bed days.

The use of public-private partnership arrangements, and the contracting out of public-hospital services to private operators, may lead to an understatement of assets used to provide public-hospital services in some jurisdictions.

**Figure D.3 Public hospital asset values (excluding land), 2007-08<sup>a</sup>**



<sup>a</sup> Asset values provided to SCRGSP by Victoria and Western Australia only apply to admitted patients. These asset values have been adjusted to apply to both admitted and non-admitted patients using the admitted-patient cost proportion. All asset values have been inflated to 2007-08 levels using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c).

Source: SCRGSP (2009).

Data constraints prevented the calculation of the UCC estimates by region or hospital size. For these disaggregations, the Australia-wide UCC for public hospitals was apportioned across groupings by the number of casemix-adjusted separations.

When disaggregating by hospital size or region, the estimates of average depreciation for public hospitals by DRG do not include Victorian depreciation data or Queensland building depreciation data — since neither are reported in the NHCDC — and thus are understated.

### Capital costs for private hospitals

Depreciation values for acute overnight private hospitals by DRG are included in the NHCDC.

Asset values are currently not reported for acute overnight private hospitals, making the calculation of the UCC difficult. The Commission estimated asset values for private hospitals from investment and depreciation data collected by the

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ABS (2008e). The estimation method involved a perpetual inventory model similar to that used by Webster et al. (1998) (box D.6). Using this method the Commission estimated an asset value for acute overnight private hospitals, based on 2003-04 to 2006-07 data on capital expenditure and depreciation from the ABS (2008e).<sup>8</sup> The resulting regression estimates indicated that the average rate of depreciation for private hospitals was approximately 6 per cent per annum.

Setting the value of the investment time horizon variable,  $H$ , between 15 and 20 years seems to be appropriate, because the resulting annual amounts of investment before 2003-04 are similar to the values for private hospitals between 2003-04 and 2006-07. This would result in an estimated total value of assets for acute overnight private hospitals of between \$3.5 billion and \$4.0 billion in 2006-07. After inflating the value of assets to 2007-08 levels using the private gross fixed capital formation index (AIHW 2009c), this would imply a range of between \$3.6 billion and \$4.1 billion for 2007-08.

An investment time horizon of 17 years was used to estimate private hospital asset values, resulting in an estimate of approximately \$3.9 billion for 2007-08. A UCC estimate for all Australian acute overnight private hospitals was then calculated by multiplying the estimated asset value by the UCC rate. The UCC rate used is 8 per cent, which is the rate used by the SCRGSP (2009).

As the ABS data are from a census of all acute overnight private hospitals, the UCC estimate was reduced using separation data so that it was in proportion to the sample in NHCDC data. No inpatient admitted-patient cost proportion was available for private hospitals, and so it was assumed that the admitted-patient cost proportion for acute overnight private hospitals was 100 per cent. The Commission acknowledges that this assumption is likely to overstate the UCC for admitted-patient services in private hospitals.

The national estimate of the UCC was apportioned to private hospitals in each jurisdiction by the proportion of total gross capital expenditure (minus land) in each jurisdiction between 2002-03 and 2006-07 (ABS 2008e). Finally, the UCC values were apportioned to individual DRGs according to the proportion of a jurisdiction's total private hospital depreciation attributable to each DRG.

The capital costs relating to diagnostic services are not included in the aforementioned calculation of private hospital capital costs as private hospitals

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<sup>8</sup> Gross capital expenditure was used as a proxy for net capital expenditure (gross capital expenditure *less* the trade-in values of replaced items and receipts for sales of replaced items) because the latter was not available. Gross capital expenditure on land was excluded in the estimation of asset values.

generally do not own the diagnostic equipment used in their hospital. However, the capital costs for this equipment are included in medical and diagnostics costs as the HCP charge data used implicitly incorporates a fee to cover capital costs.

As was the case for public hospitals, the UCC estimates by region or hospital size were calculated by apportioning the Australia-wide UCC for private hospitals across groupings by the number of casemix-adjusted separations.

#### Box D.6 Estimating asset values

The following example described by Webster et al. (1998), assumes capital prices are fixed, straight line depreciation, and constant annual amounts of net investment prior to the base period. Furthermore, it is assumed that:

$I_n$  is capital expenditure in year  $n$

$D_n$  is depreciation in year  $n$

$K_n$  is the capital stock in year  $n$

$d$  is the rate of depreciation

$K_0$  is the base period capital stock

$D_0$  is the (constant) annual amount of depreciation on the base period capital stock.

It is also assumed that capital investment occurs in the middle of the year and thus the resulting capital depreciates only for half of that year. Therefore, the following relationships hold:

$$K_1 = K_0 - D_0 + I_1 \times (1 - d/2)$$

$$D_1 = D_0 + I_1 \times d/2$$

$$K_n = K_{n-1} + I_n \times (1 - d/2) - D_0 - d \sum_{i=1}^{n-1} I_i$$

$$D_n = D_0 + I_n \times d/2 + d \sum_{i=1}^{n-1} I_i$$

(continued)

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Box D.6 (continued)

Because the values for  $I_t$  and  $D_t$  (for  $t = 1, \dots, n$ ) are known, the equations relating to depreciation all take the form:

$$y_t = D_0 + x_t \times d$$

where  $y_t$  is  $D_t$  and  $x_t$  is  $I_t$ .

It is therefore possible to estimate  $D_0$  and  $d$  by regression.

Next, it is assumed that the investments that contributed to the base period capital stock occurred in equal annual amounts over some (unknown) time horizon. For a given time horizon,  $H$ , the amount of annual investment can then be calculated and the relations above can be used to calculate the capital stock for subsequent years.

Source: Webster et al. (1998).

### *Benchmarking against asset data for major hospital groups*

To assess whether the estimated \$3.5–4.0 billion range for the total value of assets for acute overnight private hospitals for 2006-07 was plausible, published data for two major private hospital operators — Ramsay Health Care and Healthscope — were examined.

Healthscope (2007) reported that it had property, plant and equipment (excluding land) worth \$560 million at 30 June 2007. It was estimated that Ramsay Health Care had property, plant and equipment (excluding land) worth \$990 million at the same point in time.<sup>9</sup>

Both organisations have only a few free-standing day facilities and these do not account for a significant share of total assets (Ramsay Health Care, pers. comm. 23 September 2009; Healthscope, pers. comm. 24 September 2009). Therefore, the value of acute overnight private hospitals (excluding land) owned by both Ramsay Health Care and Healthscope is considered to be approximately \$1.55 billion in 2006-07.

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<sup>9</sup> Ramsay Health Care (2007) reported that it had property, plant and equipment worth \$1.16 billion in 2006-07, but does not separately publish the value of its land. Approximately 15 per cent of the total assets of both Healthscope (2007) and Australian public hospitals (SCRGSP 2009) are reported to be attributable to land. If the same proportion applied to Ramsay Health Care, then it would have property, plant and equipment worth \$990 million. This does not include Ramsay's UK hospital operations, as they were purchased in November 2007, but it does include the three hospitals it owns in Indonesia.

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It is estimated that Ramsay Health Care and Healthscope accounted for around 48 per cent of acute overnight private hospital separations in 2006-07.<sup>10</sup> If it is assumed that the cost of capital per separation was similar across all private hospital providers, then this would imply that the value of all acute overnight private hospital assets was approximately \$3.23 billion.

However, this is likely to be an underestimate of the actual value of acute overnight private hospitals because the value of property, plant and equipment reported in the annual reports of both Healthscope and Ramsay Health Care do not actually represent the market value of these assets, but are more reflective of the cost incurred when the assets were purchased, less depreciation (Ramsay Health Care, pers. comm. 23 September 2009; Healthscope, pers. comm. 24 September 2009).

While the market value of assets is not published for either company, it is possible to infer an upper bound using the company's enterprise value (box D.7). The enterprise value of acute overnight private hospitals (excluding land) is estimated to be about \$9 billion.<sup>11</sup> If this were an estimate of the total assets it would mean that the value of each business (goodwill) is equal to zero, which is not plausible. Indeed, the majority of the difference between the upper bound and the estimated value of assets (excluding land) is likely to be attributable to the value of the business.<sup>12</sup>

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<sup>10</sup> According to Ramsay Healthcare (2009), it currently admits over 750 000 patients per annum in Australia. Between 2005-06 and 2007-08, admissions in Ramsay Health Care hospitals rose by 4.35 per cent per annum (Ramsay Health Care 2007, 2008). Assuming a similar growth rate in 2008-09, it is estimated that the number of separations in Ramsay Health Care hospitals was approximately 690 000 in 2006-07. Approximately 450 000 separations were recorded in Healthscope hospitals in 2006-07 (Healthscope, pers. comm. 1 October 2009). Australian acute overnight private hospital separations reported by the AIHW (2009) were 2 371 000 in 2006-07, implying an estimated market share for Ramsay Health Care and Healthscope of around 48 per cent of all private hospital separations.

<sup>11</sup> At 30 June 2007, Ramsay Health Care had a market capitalisation of approximately \$1.94 billion and net debt worth approximately \$730 million. It therefore had an enterprise value of approximately \$2.67 billion. At 30 June 2007, Healthscope had a market capitalisation of approximately \$1.24 billion and net debt worth approximately \$550 million. It therefore had an enterprise value of approximately \$1.79 billion. Assuming a market share for Ramsay Health Care and Healthscope of approximately 48 per cent, the upper bound of the enterprise value of all overnight acute private hospitals in Australia (excluding land) is approximately \$9.3 billion.

<sup>12</sup> When Ramsay Health Care bought Affinity Holdings in 2005, Affinity had an enterprise value of approximately \$1.4 billion. This included property, plant and equipment of \$820 million at market value, implying the market value of the business was approximately \$580 million, or 41 per cent of the enterprise value. The proportion of a firm's enterprise value that is attributable to the market value of the business will differ between companies. However, if this same percentage was applied to the estimated enterprise value for all acute overnight private hospitals, it would imply that the total asset value of acute overnight private hospitals in Australia was approximately \$5.5 billion.

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### Box D.7 Enterprise value

The enterprise value of a company is an indicator of how the market values the company. It can be represented as follows:

$$EV = MC + D$$

where *EV* is enterprise value, *MC* is market capitalisation (share price × no. of ordinary shares) and *D* is the net debt (short term debt + long term debt – cash – cash equivalents).

That is, *EV* is equal to the company's market capitalisation — its share price multiplied by the number of shares — plus its net debt (debt minus cash and cash equivalents).

The market value of a company (as estimated by enterprise value) can broadly be considered to consist of the market value of its fixed assets and the market value of the business (including goodwill).

The difference between the value of property, plant and equipment and the enterprise value will be largely attributable to the sum of the:

- market value of the business (including goodwill)
- difference between reported and market values of property, plant and equipment.

Source: McClure (2004).

Another reason why the Commission's estimate of \$3.5–4.0 billion for the value of acute overnight private hospitals might be an underestimate is the use of operating leases. While the value of hospitals that are operated under finance leases are included in property, plant and equipment, the value of hospitals that are operated under operating leases are not. Both Ramsay Health Care and Healthscope operate a small number of hospitals under operating leases (Ramsay Health Care, pers. comm. 23 September 2009, Healthscope, pers. comm. 24 September 2009). However, some of these hospitals are operated as public hospitals. Furthermore, the Commission understands that most of the hospitals with operating leases are relatively small. Therefore, the Commission is of the view that not including operating leases is unlikely to result in an underestimation of overnight acute private hospital asset values of more than a few hundred million dollars.

Dr. Deeble (sub. DR56) calculated the implied depreciation rates for public and private hospitals based on estimates prepared for this study's Discussion Draft and concluded that the depreciation rates were significantly different. However, these rates were not based on the same depreciated asset values of public and private hospitals used in the calculation of costs for this study's Discussion Draft. Specifically, Dr. Deeble reverse-engineered the total UCC for both public and private hospitals using the 8 per cent UCC rate, but did not appear to adjust for

interest payments that are removed in the calculation of the UCC (box D.5). The depreciation rates implicit in the capital cost calculations detailed in this report are 4.52 per cent and 8.18 per cent for public and private hospitals respectively.

In conclusion, given the published data of Healthscope and Ramsay Health Care and the issues of operating leases and market valuations, the estimate of between \$3.5–4.0 billion for the value of acute overnight private hospitals may be an underestimate of the actual asset value. As noted previously, the estimated value of public-hospital assets may also be underestimated due to under-reporting of capital used in public-private partnership arrangements, and the contracting out of public-hospital services to private operators. The approaches used to estimate capital costs and apportion them across DRGs are summarised in table D.11. The estimated capital costs by jurisdiction are reported in table D.3.

**Table D.11 Summary of sources and methods used to estimate capital costs**

	<i>Public hospitals</i>	<i>Private hospitals</i>
<b>Cost of capital</b>		
Depreciation	<ul style="list-style-type: none"> <li>• NHCDC (DOHA, unpublished) for all states except Victoria</li> <li>• Victorian depreciation values sourced from SCRGSP (2009)</li> </ul>	<ul style="list-style-type: none"> <li>• NHCDC (DOHA, unpublished)</li> </ul>
User cost of capital	<ul style="list-style-type: none"> <li>• SCRGSP (2009)</li> </ul>	<ul style="list-style-type: none"> <li>• Commission estimates of private hospital asset values, based on ABS (2005, 2006, 2007, 2008).</li> </ul>
<b>Apportioning across DRGs</b>		
Depreciation	<ul style="list-style-type: none"> <li>• NHCDC for all states except Victoria</li> <li>• Victorian depreciation values allocated across DRGs on the basis of a weighted average of the other jurisdictions based on separations.</li> </ul>	<ul style="list-style-type: none"> <li>• NHCDC</li> </ul>
User cost of capital	<ul style="list-style-type: none"> <li>• UCC values apportioned according to the proportion of total depreciation associated with each DRG.</li> </ul>	<ul style="list-style-type: none"> <li>• UCC values apportioned according to the proportion of total depreciation associated with each DRG.</li> </ul>

Table D.12 **Estimated capital costs per casemix-adjusted separation, 2007-08<sup>a</sup>**

Dollars

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas, NT &amp; ACT<sup>b</sup></i>	<i>Australia</i>
<b>Public hospitals</b>							
User cost of capital per separation	290	212	390	252	237	301	279
Depreciation per separation	148	147	170	129	123	146	147
Total cost of capital per separation	439	359	560	381	359	447	426
<b>Private hospitals</b>							
User cost of capital per separation	97	94	104	69	129	126	100
Depreciation per separation	113	145	118	89	152	219	130
Total cost of capital per separation	210	240	223	158	281	345	230

<sup>a</sup> Australian totals may not add due to rounding. <sup>b</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: Productivity Commission estimates.

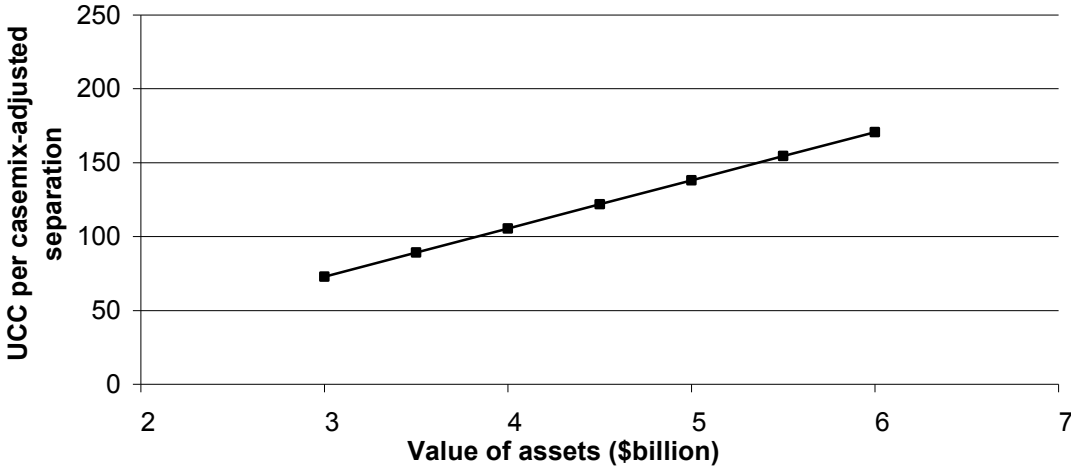
### **Sensitivity analysis of public and private sector asset values**

Because of the considerable uncertainty around the capital costs presented in this report (especially those based on private hospital and public hospital asset values), the Commission undertook a sensitivity analysis to analyse how different asset values would alter the UCC per casemix-adjusted separation. As previously discussed, the Commission considers that its estimates of private hospital asset values could be underestimated, while there are also some questions regarding the estimates of public hospital asset values. It was therefore thought useful to examine the implications of varying asset values.

NSW Department of Health (sub. 41) estimated that the value of acute overnight private hospitals was approximately \$6 billion in 2007-08, compared to the Commission's estimate of around \$3 billion. The sensitivity analysis was therefore done for a range of \$3–6 billion for the value of acute overnight private hospitals. For public hospitals, a range of \$18–24 billion was considered sufficient, given the possible data inconsistencies. The UCC per casemix-adjusted separation was calculated for both public and private hospitals for different asset values within these ranges.

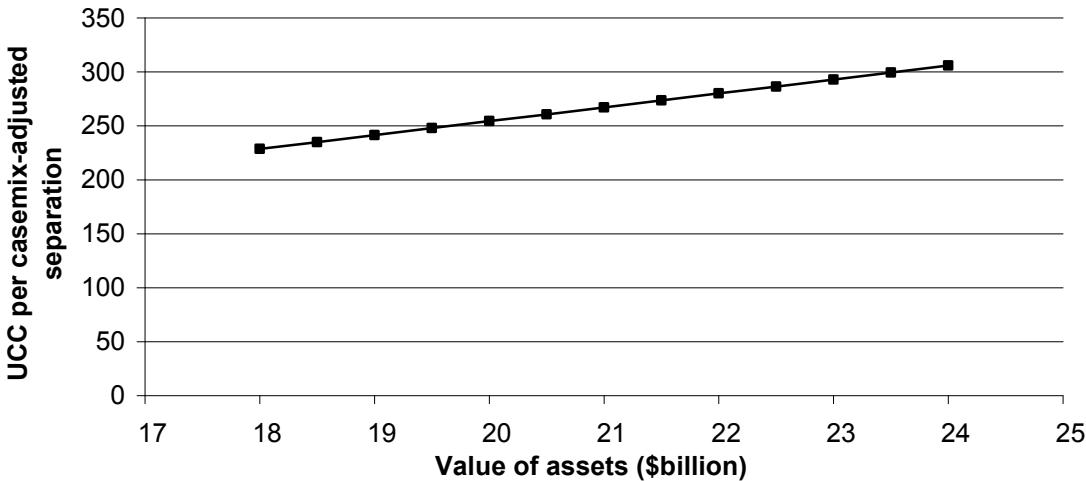
The Commission found that, if public hospitals assets were equal to \$24 billion and private hospital assets were equal to \$6 billion, then there would be a difference of almost \$135 between the UCC per casemix-adjusted separation for public and private hospitals (figures D.4 and D.5).

**Figure D.4 Sensitivity analysis for private hospital user cost of capital**



Source: Productivity Commission estimates.

**Figure D.5 Sensitivity analysis for public hospital user cost of capital**



Source: Productivity Commission estimates.

In contrast, if private hospital asset values were equal to \$6 billion, and public hospital asset values were equal to \$18 billion, then the difference in UCC per casemix-adjusted separation would still be approximately \$55.

In conclusion, the sensitivity analysis showed that, for a range of different asset values, the capital cost per casemix-adjusted separation in public hospitals is consistently higher than in private hospitals.

## D.7 Relative complexity

The large volume of renal dialysis patients in public hospitals has a major impact on the relative complexity of the public hospital casemix. Renal dialysis admissions account for around 19 per cent of all public hospital separations, and have a relatively low cost weight (table D.13). In contrast, around 3.7 per cent of private hospital admissions are for renal dialysis. Calculating average cost weights without renal dialysis separations increases the average public hospital cost weight from 0.96 to 1.01 and decreases the private hospital cost weight from 1.09 to 0.98 (table D.14).

Table D.13 **Renal dialysis and chemotherapy separations as a percentage of all separations by sector, 2007-08<sup>a</sup>**

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas, NT &amp; ACT<sup>b</sup></i>	<i>Australia</i>
<b>Public hospitals</b>							
Renal Dialysis (L61Z)	19.5	18.2	17.9	15.7	18.1	29.2	19.0
Chemotherapy (R63Z)	0.2	5.8	3.1	0.0	5.6	1.8	2.8
<b>Private hospitals</b>							
Renal Dialysis (L61Z)	3.7	0.0	8.7	0.0	0.0	0.0	3.7
Chemotherapy(R63Z)	5.7	9.6	3.3	10.7	10.7	8.0	7.1
<b>All hospitals</b>							
Renal Dialysis (L61Z)	15.8	13.1	14.4	11.3	11.8	23.0	14.6
Chemotherapy (R63Z)	1.5	6.9	3.2	3.0	7.4	3.1	4.1

<sup>a</sup> Renal dialysis and chemotherapy separations are expressed as a percentage of all separations in this cost analysis. A number of DRGs were not included in the cost analysis, as outlined in section D.1. <sup>b</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: DOHA (unpublished).

Another DRG with a high volume and low cost is chemotherapy (R63Z). It accounts for around 2.8 per cent of public hospital separations and 7.1 per cent of private hospital separations. Removing this chemotherapy DRG from calculations, in addition to the prior removal of all renal dialysis cases, causes the relative complexity of treatment across the two hospital sectors to converge to a relative cost weight of 1.00 for both public and private hospitals.

**Table D.14 Impact of renal dialysis and chemotherapy separations on average cost weights by sector, 2007-08<sup>a</sup>**

	<i>NSW</i>	<i>Vic</i>	<i>QLD</i>	<i>SA</i>	<i>WA</i>	<i>Tas, NT &amp; ACT<sup>b</sup></i>	<i>Australia</i>
<b>Public hospitals</b>							
All DRGs with > 30 seps	1.01	0.92	0.96	1.01	0.94	0.85	0.96
All DRGs with > 30 seps, without L61Z <sup>c</sup>	1.07	0.95	1.00	1.02	0.97	1.00	1.01
All DRGs with > 30 seps, without L61Z and R63Z <sup>d</sup>	1.03	0.97	0.99	0.98	0.99	0.98	1.00
<b>Private hospitals</b>							
All DRGs with > 30 seps	1.13	1.08	1.09	1.07	1.04	1.00	1.09
All DRGs with > 30 seps, without L61Z <sup>c</sup>	1.02	0.94	1.02	0.93	0.90	0.88	0.98
All DRGs with > 30 seps, without L61Z and R63Z <sup>d</sup>	1.03	0.98	1.01	0.98	0.95	0.90	1.00

<sup>a</sup> Average cost weight is the ratio of the average cost of all separations in a jurisdiction, relative to all separations. <sup>b</sup> Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. <sup>c</sup> L61Z refers to separations involving renal dialysis. <sup>d</sup> R63Z refers to separations involving chemotherapy.

Source: Productivity Commission estimates.

The DRG system includes adjacent categories (adjacent DRGs, or ADRGs) indicating the presence of comorbidities or complications which can increase the expense associated with treatment.<sup>13</sup> Less complex DRGs can be thought of as ‘bounded’ in their complexity — separations involving greater resource consumption should be categorised as belonging to an DRG corresponding with a higher level of resource consumption. DRGs that end with the suffix ‘A’ are ‘unbounded’ in their potential resource consumption in that they involve severe or catastrophic complications or comorbidities, and by definition they correspond to the highest consumption of resources within the ADRG (DOHA 2004). DRGs ending with the suffix ‘Z’ are similarly unbounded in that they are not split by resource requirements. In contrast, DRGs ending with a ‘B’, ‘C’ or ‘D’ are bounded in that there is a higher category of resource usage.

If there was a noticeable difference between sectors in the ‘complexity’ within more complex DRGs, it would be expected that removing the unbounded DRGs from the cost analysis may bring the comparative estimates of cost per casemix-adjusted separation closer together.

<sup>13</sup> For example, in AR-DRG version 5.1, the ADRG (F62) relating to heart failure includes two ‘splits’ indicating different levels of resource consumption — one involving heart failure with catastrophic complications or comorbidities (F62A), and one without (F62B).

Table D.15 suggests that there may be some difference in average cost per casemix-adjusted separation for different levels of resource requirements. For the most complex DRGs (suffix 'A'), the difference between public and private average costs is around 8 per cent of the average public cost. For other DRG levels, the difference is generally less, with the exception of 'D' DRGs, of which there are only four included in this analysis.

**Table D.15 Cost per casemix-adjusted separation for adjacent DRGs, Australia, 2007-08<sup>a</sup>**

	<i>Number of DRGs</i>	<i>Public hospitals</i>	<i>Private hospitals</i>	<i>Difference</i>
DRGs with 'A' suffix	194	4 346	3 971	375
DRGs with 'B' suffix	197	4 259	4 267	- 8
DRGs with 'C' suffix	50	4 241	4 301	- 60
DRGs with 'D' suffix	4	4 345	3 855	490
DRGs with 'Z' suffix	147	4 330	4 149	180

<sup>a</sup> DRGs with less than 30 separations in both public and private hospitals are excluded. Costs are casemix-adjusted using combined DRG-level costs weights for both public and private hospitals.

Source: Productivity Commission estimates.

Table D.16 shows that, while there may be some difference in complexity, it does not impact significantly on overall relative costs of public and private hospitals. Removing those DRGs that are unbounded in their complexity does not significantly impact on the cost difference between sectors.

**Table D.16 Cost per casemix-adjusted separation for adjacent DRGs, Australia, 2007-08<sup>a</sup>**

	<i>Public hospitals</i>	<i>Private hospitals</i>	<i>Difference</i>
All DRGs	4 302	4 172	130
DRGs with 'A', 'B', 'C', or 'D' suffix	4 291	4 285	106
DRGs with 'B', 'C', or 'D' suffix	4 255	4 274	-19

<sup>a</sup> DRGs with less than 30 separations in both public and private hospitals are excluded. Costs are casemix-adjusted using combined DRG-level costs weights for both public and private hospitals.

Source: Productivity Commission estimates.

## D.8 Prostheses costs

There are significant differences between the public and private prostheses costs. This is particularly apparent at a DRG level. Of the 20 DRGs with the greatest average cost per separation, 19 have a public hospital prosthesis cost that is less than 90 per cent of the private cost, and seven of the 20 have a public hospital

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prosthesis cost that is less than 50 per cent of the private cost (table D.17). Across the twenty DRGs presented, the public prosthesis cost is around 55 per cent that of the private prosthesis cost.

It is important to recognise that on the basis of the cost data presented, no firm conclusions can be drawn as to whether the source of the difference is differential pricing or the use of different prostheses across sectors. This is due to the lack of available price comparisons across sectors for identical items. BUPA Australia (2004) have previously presented evidence suggesting that suppliers of prostheses charge different unit prices across the two sectors, stating that the cost faced by the public sector is 55 per cent of that paid by BUPA Australia themselves for the same item.

A number of cardiac procedures also display vastly different prosthesis costs across sectors, although this may be both a product of different pricing and use of different products across sectors. For example, the average public sector prosthesis cost associated with percutaneous coronary intervention without acute myocardial infarction involving the use of stents (DRG F15Z) is estimated to be around one quarter of the prosthesis cost in the private sector. However, use of drug-eluting stents — which may cost three to four times as much as bare-metal stents — is higher in the private sector than in the public sector, and is a likely driver of the sectoral differences in prosthesis costs for this procedure (Harper 2007; McLean and Clark 2008).

However, a wider choice of more expensive devices is not necessarily the sole cause of higher prostheses prices in the private sector. The two DRGs with the costliest prostheses in the private sector (F01A and F01B) involve the implantation or replacement of an automated implantable cardioverter-defibrillator (AICD) (table D.17). As specified by the Prostheses List, benefits that are payable by private health funds for these devices on the list range from \$36 400 up to \$52 000 (DOHA 2009d). Given that the average prostheses cost for these DRGs is between \$12 100 and \$13 900 in the public sector, there appears to be a difference of over \$22 000 between the average prosthesis cost in the public sector and the least costly device available in the private sector.<sup>14</sup>

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<sup>14</sup> The Commission understands that prosthesis costs for these DRGs are not necessarily restricted to the AICD, but also involve a number of other costly components. Public costs mentioned above include these components, whereas the private cost refers only to the AICD.

Table D.17 **Prosthesis costs for selected DRGs, 2007-08<sup>a</sup>**

DRG	Description <sup>b</sup>	Public sector		Private sector	
		Separations	Average cost	Separations	Average cost
		No.	\$	No.	\$
F01A	Implantation or replacement of AICD, total system w cs cc	1 079	13 849	652	55 490
F01B	Implantation or replacement of AICD, total system w/o cs cc	885	12 154	957	49 753
I06Z	Spinal fusion w deformity	314	16 936	257	28 546
D01Z	Cochlear implant	370	21 043	276	21 918
F02Z	AICD component implantation/replacement	177	7 880	79	18 638
I01Z	Bilateral or multiple major joint procedures of lower extremity	576	9 533	1 544	16 848
I09A	Spinal fusion w cs cc	813	10 294	981	16 742
F12Z	Cardiac pacemaker implantation	4 959	3 225	4 231	13 368
I03A	Hip revision w cs cc	484	7 760	537	12 990
I09B	Spinal fusion w/o cs cc	1 516	6 761	4 577	12 939
I11Z	Limb lengthening procedures	124	3 589	56	10 971
I03C	Hip replacement w/o cs cc	7 091	5 605	10 128	10 838
F17Z	Cardiac pacemaker replacement	1 819	3 286	1 682	10 670
I03B	Hip replacement w cs cc or hip revision w/o cs cc	5 440	4 498	3 591	9 599
I05Z	Other major joint replacement and limb reattachment procedures	1 145	4 964	1 731	8 790
I04Z	Knee replacement and reattachment	10 907	6 010	17 464	8 443
F03Z	Cardiac valve proc w CPB pump w invasive cardiac inves	371	5 780	579	6 706
F04A	Cardiac valve proc w CPB pump w/o invasive cardiac inves w cs cc	1 672	4 965	1 212	6 578
F04B	Cardiac valve proc w CPB pump w/o invasive cardiac inves w/o cs cc	814	4 511	874	5 485

<sup>a</sup> Table includes 20 DRGs with the highest prosthesis costs per separation. Public and private sectors share the same top 20 DRGs. <sup>b</sup> w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. proc: procedure. AICD: automated implantable cardioverter-defibrillator CPB: cardiopulmonary bypass. inves: investigation.

Source: Productivity Commission estimates.

## D.9 Costs for patients funded by the Department of Veterans' Affairs

The Department of Veterans' Affairs (DVA) is responsible for providing health care to veterans and their dependants on behalf of the Repatriation Commission (box D.8). In 2006-07, DVA-funded patients represented around 2.8 per cent of all separations in public hospitals and 7.1 per cent of separations in private hospitals

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(AIHW 2008b). As a client of both the public and private hospital sectors across Australia, DVA's experience could provide useful insights into the relative performance of the two sectors.

**Box D.8 Health care arrangements for veterans and their dependants**

The Repatriation Commission is responsible under the *Veterans' Entitlements Act 1986* (Cwlth) for the provision of health services to eligible veterans and their dependants. This responsibility is administered on behalf of the Repatriation Commission by the Department of Veterans' Affairs (DVA) and covers a range of available health care, including general practitioner and allied-health treatment, in-home care and support, and hospital care in both public and private hospitals.

In providing these services, over \$4 billion was spent in the last year, with \$1.7 billion being spent on hospital services. In funding veteran health care, DVA covers the full cost of treatment — there are no 'gap' payments made by veterans.

Currently there are around 272 000 veterans that are eligible for health services provided by the Repatriation Commission. The Repatriation Commission notes that there is a high risk of complications developing over the course of hospitalisation of veterans given their age profile — 91 per cent of eligible veterans are over the age of 55, and 67 per cent over the age of 75. This risk is a potentially significant burden in terms of cost to DVA.

*Source:* Repatriation Commission (sub. 39).

The Commission obtained data from DVA on the costs it has incurred in procuring hospital services for veterans and their dependants. DVA identified the top 20 DRGs in terms of total cost between 2003-04 and 2006-07.<sup>15</sup>

A number of study participants cautioned that DVA patients are not necessarily representative, with the procedures they undergo — and the difficulties associated with them — likely to differ from those of the broader population (for example, ACT Health, sub. DR52). This may be the case where the DVA patient cohort is comprised exclusively of veterans. However, given that more than 50 per cent of DVA's patients are dependents — typically spouses of veterans, and often without war-related illnesses — it is reasonable to expect that there are commonalities with the general population. Procedures common to DVA patients could also be common to those not eligible for DVA-provided health care but of similar demographic profile. Further, DVA patients are often treated in the same hospitals and by the same clinicians as other private patients. As such, the DVA data may provide a

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<sup>15</sup> Excluding mental health and rehabilitation DRGs and services involving sub-acute and non-acute care.

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broad indication of the robustness of the Commission’s general findings based on the NHCDC and HCP.

One way of assessing how similar DVA and other patients are is to compare their average length of stay (ALOS) for a given DRG. ALOS is admittedly a crude measure of patient heterogeneity, as it can be affected by a range of factors, including comorbidities, age-related factors, clinical practice, and purchasing/funding models. Nevertheless, a higher ALOS might be expected for DVA patients because they tend to be older than the general population with a higher incidence of comorbidities. Among the 20 DRGs for which the Commission obtained DVA data, almost all had a higher ALOS for DVA patients than for the NHCDC sample used in the Commission’s cost analysis (table D.18). Excluding same-day procedures (lens procedures and renal dialysis), ALOS was on average 16 per cent higher for DVA patients.

Another concern expressed by study participants was that the DVA data are for payments based on prices negotiated between DVA and the providers of hospital services, rather than the cost of providing those services. The extent to which there is a mark up over costs could vary across jurisdictions for public hospitals and between different operators of private hospitals.

The Commission understands that there are notable differences between jurisdictions in how contracts are structured between DVA and public hospitals. For example, in some jurisdictions the cost of prostheses is included in a ‘bundled charge’. Other jurisdictions charge for prostheses separately via the hospitals, in an arrangement similar to that between DVA and private hospitals. The cost of prostheses is included in the analysis below to ensure comparability between hospitals.

It is also important to note that DVA contracts with private hospitals do not cover payments to medical specialists, non-salaried allied health, diagnostic, radiology, and pathology services. These payments are settled separately by DVA with the specialists, and recorded in the data as a separate medical payment.

**Table D.18 Comparison of average length of stay for DVA and NHCDC patients, selected DRGs, 2006-07<sup>a</sup>**

DRG	Description <sup>c</sup>	DVA population <sup>b</sup>		NHCDC sample	
		Public hospitals	Private hospitals	Public hospitals	Private hospitals
I04Z	Knee Replacement and Reattachment	8.6	8.3	7.1	7.4
A06Z	Tracheostomy or Ventilation >95 hours	26.9	33.7	29.4	31.9
F12Z	Cardiac Pacemaker Implantation	6.2	4.9	4.6	4.1
F15Z	Percutaneous Coronary Intervention W/O AMI W Stent Implantation	4.0	3.3	2.3	2.2
E65A	Chronic Obstructive Airways Disease W Catastrophic or Severe CC	8.5	11.8	7.4	11.1
I03C	Hip Replacement W/O Catastrophic or Severe CC	8.4	8.4	6.8	7.2
I03B	Hip Replacement W Cat or Sev CC or Hip Revision W/O Cat or Sev CC	13.8	12.9	12.1	10.7
F62B	Heart Failure and Shock W/O Catastrophic CC	6.0	8.5	4.8	7.5
I08A	Other Hip and Femur Procedures W Catastrophic or Severe CC	14.0	18.1	14.7	16.5
E62A	Respiratory Infections/Inflammations W Catastrophic CC	10.5	14.4	10.0	12.8
F42B	Circulatory Disorders W/O AMI W Invasive Cardiac Inves Proc W/O C	2.5	1.9	1.9	1.5
B63Z	Dementia and Other Chronic Disturbances of Cerebral Function	17.1	14.4	12.3	15.0
E62B	Respiratory Infections/Inflammations W Severe or Moderate CC	6.6	9.4	5.8	8.1
F62A	Heart Failure and Shock W Catastrophic CC	11.6	15.5	10.5	14.5
E65B	Chronic Obstructive Airways Disease W/O Catastrophic or Severe CC	4.7	8.2	4.5	7.2
B70A	Stroke W Catastrophic CC	16.5	21.3	16.5	19.2
G02A	Major Small and Large Bowel Procedures W Catastrophic CC	17.4	18.4	17.1	16.7
F08B	Major Reconstruct Vascular Procedures W/O CPB Pump W/O Catastrophe	8.3	8.3	7.3	7.4

<sup>a</sup> DRGS are ranked by total cost across sectors by the Department of Veterans' Affairs for the four-year period 2003-04 to 2006-07. Renal dialysis (L61Z) and sameday lens procedures (C16B) are excluded from this table as they have an average length of stay (ALOS) of one day by definition. ALOS for the DVA population is for 2006-07. The NHCDC sample data is for 2007-08, and includes both public and private patients. <sup>b</sup> ALOS for the DVA population is the total number of occupied bed days divided by the number of separations for each selected DRG. <sup>c</sup> w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. AMI: acute myocardial infarction. CPB: cardiopulmonary bypass. inves: investigation.

Source: Department of Health and Ageing (unpublished data); Department of Veterans' Affairs (unpublished data).

DVA patients in public hospitals are admitted as private patients and so are entitled to choose their doctor. As a result, medical costs for DVA patients in public hospitals are a combination of items billed by hospitals (services provided by salaried medical officers) and items billed separately by private medical

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specialists.<sup>16</sup> Prostheses are generally paid for separately in public hospitals by DVA. To ensure comparability between public and private hospitals, medical items billed by both hospitals and specialists are included in the analysis below.<sup>17</sup>

Among the 20 DRGs for which DVA provided data to the Commission, 70 per cent (14 DRGs) had a lower cost per separation in public hospitals in 2006-07 (table D.19). However, the difference in cost between the public and private sectors was relatively small on average across the 20 DRGs (cost per separation in public hospitals about 4 per cent lower than private hospitals).

Nevertheless, many of the DRGs had a cost difference that was relatively large. Around two-thirds of DRGs had a cost per separation in public hospitals that was more than 10 per cent lower or higher than in private hospitals. At the extremes:

- cost per separation in public hospitals for percutaneous coronary intervention without acute myocardial infarction, with stent implantation (F15Z), was 42 per cent (\$8449) lower than in private hospitals
- cost per separation in public hospitals for dementia and other chronic disturbances of cerebral function (B63Z) was 50 per cent greater (\$3943) than in private hospitals.

Cardiac procedures involving large prostheses costs — in particular, stenting and cardiac pacemaker implantation (F12Z and F15Z) — had a cost per separation that was more than 10 per cent lower in public hospitals, compared to private hospitals. This is broadly consistent with the Commission's DRG-level cost estimates. Public hospitals also had a lower cost for treating heart failure and shock with and without catastrophic complications or comorbidities (F62A and F62B).

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<sup>16</sup> Costs for non-salaried medical officers are standard across both sectors, according to a fee set by DVA.

<sup>17</sup> For DVA patients in public hospitals, medical and prostheses costs were identified by DVA as costs incurred between the date of admission and date of separation. This may overstate the costs associated with a hospital episode of care, if the patient incurred health costs outside a hospital on the admission or separation date. The impact of this is considered to be negligible. DVA further advised that, particularly for public hospitals, there are a range of cost components that are not readily attributable to DRGs and so may be excluded from the cost estimates (DVA, pers. comm. 20 November 2009).

**Table D.19 Separations and episode costs for DVA patients, selected DRGs, 2006-07<sup>a</sup>**

DRG	Description <sup>b</sup>	Separations		Cost per separation	
		Public	Private	Public <sup>c</sup>	Private <sup>d</sup>
		no.	no.	\$	\$
I04Z	Knee replacement and reattachment	101	2 147	21 375	21 518
A06Z	Tracheostomy or ventilation >95 hours	235	197	80 069	82 370
F12Z	Cardiac pacemaker implantation	244	1 368	18 476	21 292
C16B	Lens procedures, sameday	831	7 881	3 436	3 387
F15Z	Percutaneous coronary intervention w/o AMI w stent implantation	97	1 335	11 512	19 961
E65A	Chronic obstructive airways disease w cs cc	2 180	1 608	6 734	8 008
I03C	Hip replacement w/o cs cc	231	935	19 428	22 446
I03B	Hip replacement w cs cc or hip revision w/o cs cc	405	634	23 229	24 680
F62B	Heart failure and shock w/o catastrophic cc	2 470	2 065	4 726	6 047
I08A	Other hip and femur procedures w cs cc	661	354	19 008	19 065
E62A	Respiratory infections/inflammations w catastrophic cc	1 278	706	9 436	10 032
F42B	Circulatory disorders w/o AMI w invasive cardiac inves proc w/o cc	259	2 898	5 049	5 693
L61Z	Admit for renal dialysis	22 437	12 744	516	399
B63Z	Dementia and other chronic disturbances of cerebral function	1 050	583	11 264	7 526
E62B	Respiratory infections/inflammations w severe or moderate cc	1 494	1 187	5 425	6 612
F62A	Heart failure and shock w catastrophic cc	906	624	9 662	10 921
E65B	Chronic obstructive airways disease w/o cs cc	1 771	1 489	3 892	5 509
B70A	Stroke w catastrophic cc	763	272	14 694	12 960
G02A	Major small and large bowel procedures w catastrophic cc	226	356	27 608	23 665
F08B	Major reconstructive vascular procedures w/o CPB pump w/o catastrophic cc	107	551	20 312	18 614

<sup>a</sup> Top 20 DRGs ordered in terms of total cost incurred by DVA over the four-year period 2003-04 to 2006-07. Activity in standalone day procedure centres was excluded. DVA advised that, particularly for public hospitals, there are a range of cost components that are not readily attributable to DRGs and so may be excluded from the cost estimates. <sup>b</sup> w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. AMI: acute myocardial infarction. CPB: cardiopulmonary bypass. inves: investigation. <sup>c</sup> Public costs include data supplied by DVA as hospital, medical and prostheses costs. Costs of public hospital episodes are indicative because they include South Australian costing rates that have yet to be finalised. <sup>d</sup> Private costs include data supplied by DVA as hospital medical, prostheses, theatre, accommodation, bundled and other costs. Medical costs include diagnostics costs and allied health costs. Pharmacy and Intensive Care Unit costs are not included.

Source: Department of Veterans' Affairs (unpublished data); Productivity Commission estimates.

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The DVA cost data provide a useful point of comparison with the Commission's DRG-level cost estimates, although such a comparison needs to be viewed in light of the abovementioned qualifications. To enable such comparisons, the Commission's 2007-08 estimates were deflated to 2006-07 values using the total Health Price Index (AIHW 2009c). It was found that:

- The cost per separation for DVA patients in public hospitals is within 90 to 110 per cent of the Commission's estimate for six out of the 20 DRGs. The cost for DVA patients was more than 10 per cent below the Commission's estimate for seven DRGs, and more than 10 per cent above for the remaining seven DRGs.
- The cost per separation for DVA patients in private hospitals appears to be more comparable to the Commission's estimates. The cost for DVA patients in private hospitals was within 90 to 110 per cent of the Commission's estimate for ten out of the 20 DRGs. The cost for DVA patients was more than 10 per cent below the Commission's estimate for three DRGs, and more than 10 per cent above for the remaining seven DRGs.