Review of Direct and Indirect Teaching and Research Factor: NSW Health Resource Distribution Formula

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December 2009

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Acknowledgments

The Centre for Health Service Development would like to gratefully acknowledge the numerous individuals and groups who contributed to this study. We would particularly like to thank the following for their support and guidance:

- The NSW Health RDF Technical Advisory Committee
- The NSW Department of Health staff who were so helpful in extracting data according to our specifications
- Mr John Slater, A/Manager Resource Allocation and Ms Maria Kokkoris, Senior Policy Analyst, Resource Allocation Unit, Inter-Government & Funding Strategies Branch, NSW Department of Health

Suggested citation

Eagar K, et al. (2009) ***Review of Direct and Indirect Teaching and Research Factor: NSW Health Resource Distribution Formula***. Centre for Health Service Development, University of Wollongong

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Executive summary

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The Centre for Health Service Development, Sydney Business School, University of Wollongong was engaged by the NSW Department of Health to review both the 'Direct' and 'Indirect' Teaching and Research Factors in the existing version of the RDF and this is the final report on the project.

The project methodology has included an international literature review, consultations with other states and territories and two teleconference consultations with representatives of Area Health Services. A background paper was distributed to Area Health Services to guide these consultations.

Section 3 (page 6) synthesises the results of the literature review, Section 5 (page 21) sets out recommendations arising from the Area Health Service consultations and Section 6 (page 24) sets out the results based on modelling both the recommendations from the consultations and other options.

Section 7 (page 32) sets out a series of recommendations, the rationale for each and the results of adopting these recommendations. The eight key recommendations are as follows:

Intensive Care

Recommendation 1. That the full cost of care for Intensive Care (IC) patients (not High Dependency patients) in designated ICUs (as per the Episode Funding Guidelines) continue to be built into the RDF.

Recommendation 2. That the cost of IC be moved out of the Teaching and Research component of the RDF and into the Acute Care component of the RDF.

Direct Teaching, Research and Learning

Recommendation 3. That the Direct Teaching and Research component be based on the cost of designated teaching, learning and research related positions with proportional weightings based on judgments about the average percentage of staff time that is devoted to teaching, learning and research.

Recommendation 4. That the weighting for Clinical Academics be reduced from 1.0 (in the previous version of the RDF) to 0.8.

Recommendation 5. That the time period used to calculate each Area's share of teaching, research and learning positions be the last two years.

Recommendation 6. That HCCC activity no longer be included in the calculation of the direct Teaching and Research component of the RDF.

Indirect Teaching, Research and Learning

Recommendation 7. That a new Blended Index be introduced to calculate Indirect Teaching, Research and Learning shares based on three elements (1) Direct Teaching, Research and Learning positions (2) raw Medical and Surgical HCCC and (3) case weighted raw Medical and Surgical HCCC

Recommendation 8. That all hospitals in the A and B peer groups in all Area Health Services be in-scope for this element of the RDF.

1 Introduction

The key purpose of the NSW Resource Distribution Formula (RDF) is to guide the allocation of funds from the NSW Department of Health to the geographically based Area Health Services in NSW Health. The RDF consists of nine components that are reviewed periodically. 'Teaching and Research' is one of these components and is the focus of this review.

1.1 Overview of methodology

The methodology has consisted of five key steps:

- A review of both the international and national literature
- Identification of options based both on the literature and on targeted consultations with key stakeholders
- Modelling both the current approach and other possible options at the 8 AHS level, adjusted 17 AHS level (adjusted for 2005 boundary changes) and the RDF AHS population cluster level.
- Preparation of a draft final report (this report)
- Seeking feedback on this draft report and finalising the final report following this feedback

1.2 Context

The last major revision of the RDF was issued in 2005. This process of review is oversighted by the RDF Technical Committee, which consists of several Departmental and non-Departmental representatives with specific expertise in resource allocation methods. The RDF Technical Committee's forward work program ensures the periodic review of various components of the RDF. In addition, other planned work (not driven by the RDF but relevant to this analysis) has been incorporated, for example, the recent review of high cost complex casemix (HCCC) DRGs (this is relevant to the direct teaching and research factor); the review of ICU episode funding guidelines (this is relevant to the indirect teaching and research factor) and the review of hospital peer groups.

Funding to NSW geographic regions (Area Health Services) is based on the principle of providing these regions with resources to provide comparable access to health services that meet the health needs of their respective population, while recognising that high cost and specialised services should be provided in a limited number of locations due to their high cost and low volumes. The Resource Distribution Formula (RDF) has been used as a planning tool to guide the allocation of funding to Area Health Services and to monitor progress towards the achievement of funding equity.

The direct teaching and research and indirect teaching and research factors within the RDF have both been subject to debate over the years as to the most appropriate methodology for development of each factor. NSW Health through the RDF Technical Committee has determined that it is now timely to review these factors. This review is part of a scheduled work program that involves the RDF Technical Committee progressively reviewing and refining each component within the overall RDF.

2 Background

2.1 The Resource Distribution Formula in NSW

The purpose of the RDF is to identify equitable shares of available resources for Area Health Services. The Formula does not identify the total level of resources available, as this is a matter for Government to decide in the context of the State Budget.

The RDF approach was adopted in the late 1980s to reduce disparities in funding across NSW, over the ensuing years significant progress has been made towards fairer funding for historically under-funded population growth areas. In the 2005 revision, the weighted average distance from target for the State's 8 Area Health Services was around 1.8% (facilitated by the combining of under-resourced Area Health Services with better resourced Areas through the NSW Health restructure effective from 1 January 2005).

In allocating resources to Area Health Services, the RDF assumes that services will be provided at comparable levels of efficiency.

The nine components of the RDF align to the program funding structure of NSW Health:

- Population Health
- Oral Health Services
- Primary and Community Based Services
- Outpatients
- Emergency Department Services
- Acute Inpatient Services
- Mental Health Services
- Rehabilitation and Extended Care
- Teaching and Research

Each component is considered in the context of population and need factors and cost factors. The Teaching and Research factors are explained further in Section 2.2. A comprehensive explanation of the other components is included in the NSW Department of Health (2005), *'Resource Distribution Formula Technical Paper, 2005 Revision.'*

2.2 Teaching and Research Factors in the RDF

There are two relevant components in the RDF. The 'Direct Teaching and Research' factor covers not only teaching and research but also learning. The 'Indirect Teaching and Research' factor covers not only the indirect costs of teaching, research and learning. It also includes differences in patient severity that cannot adequately be measured by the AR-DRG classification (within DRG variations that cannot be explained).

The various methodologies built into the RDF for both the direct teaching and research and indirect teaching and research factor have been subject to development and debate over the years. The initial approach assumed that the higher costs of 'teaching hospitals' that could not be explained by casemix must be due to the additional costs of teaching and/or research. The gap in the cost difference between teaching and other hospitals became the original Teaching and Research factor in the RDF.

The alternative view put, but never seriously investigated, was that at least some of this gap reflected differences in efficiency. This alternative perspective suggested that, due to the fact that they had historically been better funded, the principal teaching hospitals may not be as efficient as their metropolitan district and rural base counterparts. This perspective argued that, at least in part, the Teaching and Research Factor works to mask any differences in efficiency and is inherently regressive.

A further perspective along the same lines relates to differences in staff mix. While principal referral hospitals may bear additional costs associated with, for example, the training of junior doctors, these costs (or at least some of them) are offset by not needing to rely on Visiting Medical Staff who are remunerated at much higher levels.

The gap between the cost of principal teaching and other hospitals has narrowed over time as both the AR-DRG classification and costing systems have improved. At the same time, there have been some important changes in practice, including an increasing role for rural base and metropolitan hospitals in clinical training and in research and in providing clinical care for more complex patients than in the past. These changes need to be taken into account in this review of both the indirect and direct factors in the RDF. The current approach (2005 revision and the subsequent updates) can be summarised as follows:

Direct Teaching and Research costs are built into the RDF model based on the share of High Cost Complex Casemix (HCCC) activity and the number and weighted cost of staff associated with teaching and research activity. Staff category weightings are based on judgements about what proportion of staff costs can be attributed to teaching, learning and research versus clinical care. The results of this approach in the current version of the RDF are included in Table 1.

Table 1 Direct Teaching and Research Component

Area Health Service	2007-08 HCCC Activity, %	2007-08 Estimated Staff Costs, %	Blended Percentage Share
500 Sydney South West	19	23	21
510 South Eastern Sydney/ Illawarra	31	23	27
520 Sydney West	16	17	17
530 Northern Sydney/Central Coast	19	15	17
540 Hunter/New England	12	11	11
550 North Coast	1	5	3
560 Greater Southern	1	3	2
570 Greater Western	1	3	2
Total	**100**	**100**	**100**

Source: Data included in the NSW Health Request for Quotation: Review of Direct Teaching & Research Factor in the Resource Distribution Formula

Indirect Teaching and Research costs in the latest version of the RDF are built in largely based on the full cost of Intensive Care patients. A residual component for this factor is based on the difference in the cost between principal referral and other hospitals, which is distributed based on the share of HCCC activity. In the latest version of the RDF, the Indirect T&R factor was $385 million, of which $97.5 million was the residual component. This was a larger amount than previous versions because care for IC patients in rural NSW was included for the first time.

The $97.5m residual component is based on the cost of case weighted HCCC activity in principal teaching hospitals for residents who live in the catchment area of the relevant AHS. The rationale for this appears to be that inter-Area flow for HCCC activity is fully built into the RDF in the Acute Care component. This is an issue we return to later in this report.

Table 2 sets out the methodology for the calculation of the residual component in more detail in the 2007 version. On average, the principal referral hospitals had an average cost per case weighted separation that was $277 more than other hospitals. This represented increased total costs in the principal teaching hospitals of $174.12m (relative to other hospitals).

In total, 56% of total HCCC activity in these hospitals was for patients living in the catchment Area Health Service of the principal teaching hospital. Accordingly, the indirect residual component was assessed to be 56% of this $174.12m or $97.47m in total.

Table 2 RDF model costs in 2007

Average Cost per Case Weighted Separation for Principal Referral Hospitals	$3,829
Average Cost per Case Weighted Separation for Other Hospitals	$3,552
Difference	$277
Total Case Weighted Separations for Principal Referral Hospitals (not just HCCC separations)	629,427
Difference in Cost Between Principal Referral and Other Hospitals (629,427 case weights @ $277)	$174,115,530
HCCC Local Activity Principal Referrals (56% of total HCCC activity)	$97,465,718

The gap between the cost of principal referral and other hospitals has narrowed over time as both the AR-DRG classification and costing systems have improved. At the same time, there have been some important changes in practice, including an increasing role for rural base and metropolitan hospitals in clinical training and in research and in providing clinical care for more complex patients than in the past. These changes need to be taken into account in this current review of both the indirect and direct factors in the RDF.

2.2.1 Summary of changes since the 2007 that are relevant to this review

- The gap between the cost of principal referral and other hospitals has narrowed
- Changes in practice, including an increasing role for rural base and metropolitan hospitals in clinical training and in research and in providing clinical care for more complex patients than in the past
- New version of the AR-DRG classification and associated cost weights
- 2009 review of hospital peer groups - the following tables are based on the recommendations in this review
- 2009 review of the list of DRGs classified as High Cost Complex Casemix (HCCC)
- New industrial awards and classifications - the following tables are based on a mapping from the award categories used in 2007 to these new awards and classifications.

3 Literature Review

Our literature review has focused on the current methodologies used in other jurisdictions and countries to allocate funding to address the additional costs of teaching and research in acute public hospitals.

3.1 General Approach

The literature search examined articles and publications provided by NSW Health, also those previously assembled at CHSD through previous related projects. These resources quickly identified frequently published authors in this field. They also assisted in identifying the key concepts and constructs with possible relevance to the current research question. Through the identification of key concepts and constructs a foundation for search terms could be established. These search terms were then used to systematically trawl core clinical journals.

We then broadened our search to the practice literature by searching Australian Government web-sites and Department of Health web-site for every Australian State and Territory. Based on our existing knowledge of the issues, we have specifically searched government web-sites in New Zealand, Canada, the UK and the USA. We also undertook a brief scan to see if there is relevant new literature from other countries, particularly European and Scandinavian countries.

3.2 Search Strategy

The American National Library of Medicine; Medical Subject Headings (MeSH) were employed to develop a concise and unified range of search terms, which formed the basis of our literature searches. The mesh tree terms used were found beneath two sectional headings: Anthropology, Education, Sociology and Social Phenomena [I] and Health Care [N]. Figure 1 diagrammatically depicts the MeSH Tree Headings and identified search terms.

A number of combinations of the Mesh terms were employed to narrow down the search and identify the most relevant articles:

- hospitals, teaching and cost allocation;
- academic medical centres and health care costs or costs and cost analysis;
- hospitals, academic medical centres and resource allocation; and a
- academic medical centres and models, economic.

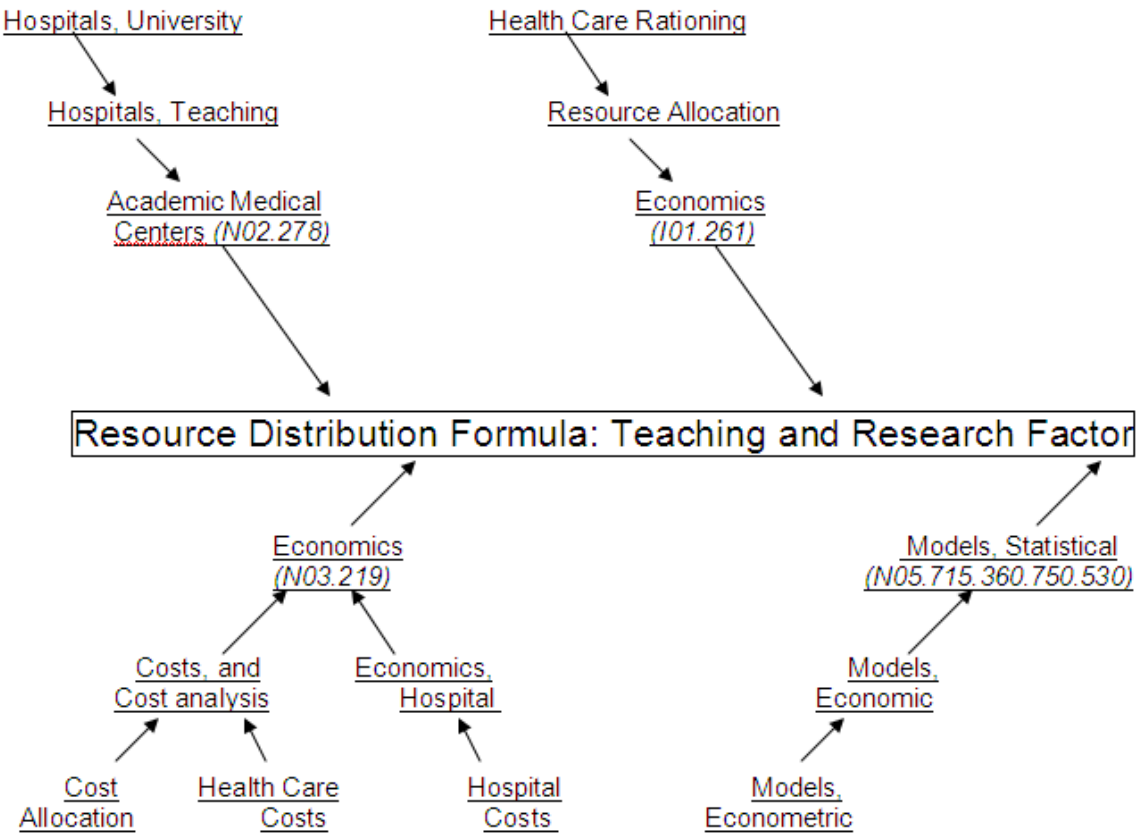
Search limiters used included: English language, core clinical journals and publication after the year 1999.

The initial database searched was Medline, with the search extended to CINAHL, Nursing and Allied Health Source and Proquest. Searches of other databases failed to produce a significant amount of relevant material; these databases included APAFT, ERIC, Meditext and Psychinfo. We used the identified key terms in various combinations to search databases of systematic reviews, including the Cochrane Collaboration database, the Turning Research into Practice (TRIP) and the Database of Abstracts of Reviews of Effects (DARE). The Cochrane database proved the most relevant with the latter two revealing few resources, probably due to their clinical nature. Practice literature searches occurred through Google and Google Scholar with adjustment of search terms to include: 'need adjusted capitation funding'.

From the searches conducted in the databases indentified above, a number of individual journals were identified that repeatedly published articles relevant to the research topic. Two such journals included *Health Affairs* and *Health Economics*. These journals were then individually 'hand searched' dating back to 2000, to identify other previously published articles, producing a number of relevant articles. In addition we checked the citation records of leading authors who had

previously published relevant articles prior to 2005 seeking any new information they may have contributed to this field that had not been uncovered through our previous searches.

Figure 1 Literature review search terms



3.3 International Applications of a Resource Distribution Formula – Teaching and Research

This literature review focuses on international experience in the UK, US, Canada and New Zealand. The majority of developed countries reviewed do provide an additional allocation to compensate teaching hospitals for the costs of teaching and research (England, Scotland, US, Canada, New Zealand, Australia, France and Finland).

Most of the seminal literature relating to the costs of teaching and research in hospitals is dated and was published in the late 1980s and 1990s. The most progressive international literature comes from the UK and the US. Studies to estimate cost differences and their causes fall into two broad groups: bottom-up approaches that study the processes of teaching and the resources required and top-down studies that focus on the differences in the costs of patient care between teaching and non-teaching institutions (Sloan and Valvona 1986; Bevan G and Rutten F 1987; Finnerty 1996; Linnakko 1997; Reuter 1997; Linna, Hakkinen et al. 1998; Mechanic, Coleman et al. 1998; Anderson, Greenberg et al. 1999; Bedard, Dorland et al. 1999; Bevan 1999; Clack, Bevan et al. 1999; Freburger and Hurley 1999; Lopez-Casasnovas and Saez 1999; Medpac 1999; Dalton and Norton 2000; Dauphinee 2000; Dickler and Shaw 2000; Duffy, Ruseski et al. 2000; Morey, Retzlaff-Roberts et al. 2000; The Commonwealth Fund 2000; Fryer, Green et al. 2001; Grosskopf, Margaritis et al. 2001; Huttin and De Pouvourville 2001; Newhouse and Wilensky 2001; Nicholson and Song 2001; Rice and Smith 2001; Ayanian and Weissman 2002; Dobson, Koenig et al. 2002; Guterman 2003; Koenig, Dobson et al. 2003; Newhouse 2003; Standing Committee on Resource Allocation NHS Scotland 2003; Phillips, Fryer et al. 2004).

Asia has not been included as database searching did not produce any recent literature that addressed resource based allocation models in Asia. Two articles were identified within our search parameters, Wagstaff et al. (2009) provide an interesting review of China's health system and its reform and Cao et al. (2006) analyse the profit and loss for an intensive care unit in Japan. In this specific study they found that the direct costs accounted for 88.8% of total ICU costs. No articles were found relating specifically to teaching and research payments to acute hospitals.

3.3.1 United Kingdom

In the United Kingdom (UK) both indirect and direct costs of teaching and research are funded. Indirect payments reflect the higher cost per case observed in teaching hospitals that cannot be specifically allocated to medical education programs (British Medical Association 2007). Proxy measures are used for the indirect costs of teaching and research. For example relating the difference in costs between major teaching hospitals to the number of students taught and then calculating the median excess cost per student (as in the NHS) (Bevan G and Rutten F 1987; Bevan 1999; Clack, Bevan et al. 1999).

Most direct cost measures rely on data relating to numbers of employees in 'training' positions; student numbers alone are seen as too simplistic a measure. One of the fundamental problems associated with identifying these costs, and trying to disaggregate them from patient care, research and postgraduate medical education, is that conceptually they are 'joint products' or 'mixed products'. There may be several outputs from one episode of patient care i.e. teaching is not the only output. Teaching hospitals are consistently reported to be more costly than non teaching hospitals (Bevan 1999; Medpac 1999; Dobson, Koenig et al. 2002; Medpac 2009).

In Wales, the Higher Education Funding Council for Wales receives its resource from the Welsh Office, which is also responsible for funding SIFT. Grant income and tuition fees are paid to the medical schools, whereas SIFT is paid directly to the National Health Service (NHS) units providing the service facilities for teaching. There are similar arrangements to SIFT in Scotland through the Additional Cost of Teaching payment (ACT) and in Northern Ireland with the Supplement for Teaching and Research (STAR) (Bevan G and Rutten F 1987).

One of the most useful references found is 'Research on Additional Costs of Teaching in NHS Scotland: Report for Standing Committee' (Spollen M, Dixon P et al. 2003; Standing Committee on Resource Allocation NHS Scotland 2003)[1]. This paper provides a summary from the literature of the estimates of additional costs in teaching hospitals (adapted and expanded from Linna et al. 1998), the range of additional cost estimates for teaching hospitals in the US extends from 0-25%; Spain 3-11.1%, Finland 15%, England 4 – 43% (these studies were published from 1983-1996). The 'Additional Costs of Teaching' (ACT) payment is not a payment for teaching. It is NHS money allocated to cover the cost of supporting the teaching of medical undergraduates and the medical teaching of dental students. The funds must be used within the NHS. They must not be used to support University functions (Scottish Executive Health Department 2005)

Price signals about the cost and value of different activities were missing in England until 2004 when the NHS made an important transition in hospital payments from a system based largely on block grants to a system based on activity-based payments (Ellis and Vidal-Fernandez 2007)

The NHS has a separate research and development strategy documented in the 'Best Research for Best Health'. Funding is allocated on a population based model and on an open and competitive basis. For the past five years, the funding to support research in the NHS (£500 million out of a total R&D budget of £650 million) has been allocated to NHS Trusts through a formal NHS contract (National Health Service 2006; National Health Service 2009).

[1] (http://www.scotland.gov.uk/Publications/2004/03/19120/34750

3.3.2 United States

There is a consistent trend in the international literature that countries are trying to better understand the true costs of teaching and research and this is being driven by cost rationalisations (e.g. the US Balanced Budget Act of 1997).

The funding strategies of teaching and research in the United States Health Care system are primarily based on payments provided by Medicare. The Medicare payments to teaching hospitals are arranged into two categories. Firstly the direct graduate medical education payment is said to be inclusive of resident salaries and benefits (determined by a hospital-specific rate per full time equivalent resident), supervisory physician salaries, and administrative overhead expenses (Reuter 1997). A small amount is also provided by Medicare in the support of the direct costs of hospital based funding and training for nursing and various allied health professions (Medpac 2009). The other payment is the indirect medical education payment, which accounts for the higher costs of patient care associated with care in teaching hospitals, such as unmeasured patient severity, residents 'learning by doing,' and greater use of emerging technologies. The indirect payment is determined based on the ratio of residents and interns to beds as documented in the US Balanced Budget Act of 1997. The formula used to calculate this indirect payment provides a percentage add-on to the diagnosis-related group payment a teaching hospital receives for most Medicare patients (Medpac 2009).

Medicare subsidises the education and training for approximately 90,000 resident positions each year at a cost of roughly $US100,000 per year through both direct and indirect payments for graduate medical education in more than 1,100 hospitals resulting in approximately $US9B in payments per year for residency programs (Medpac 2009). The payments provided by Medicare however, do not fully support the teaching missions at these facilities. With Academic Health Centres (AHCs) and other teaching hospitals charging more then the cost of treatment to private patients to gain revenue to subsidise the funding gap (Dobson, Koenig et al. 2002).

A cost analysis performed by 'The Lewin Group' and reported by the Commonwealth Fund, looked at the cost per case for AHCs using data from the fiscal year 1998. Whilst dated, this analysis identified that the AHC cost per case was $8,548, higher than the cost of other teaching hospitals at $6,047 per case and non-teaching facilities, with a cost of $5,238 per case (The Commonwealth Fund 2003). Estimates into the costs of mission based activities within teaching hospitals suggest a cost differential of approximately 30 percent of the cost per case (Dobson, Koenig et al. 2002).

Several authors analyse the differences in costs between teaching hospitals and non-teaching hospitals (Reuter 1997; Fryer, Green et al. 2001; Grosskopf, Margaritis et al. 2001; Grosskopf, Margaritis et al. 2004). It is commonly accepted that teaching hospitals in the United States and internationally have greater costs despite providing similar care to other non-teaching facilities.

There are many and varied reasons for these higher costs such as:

- Inefficiencies of interns and residents, (due to their clinical inexperience)
- Greater complexity in the patients referred to teaching hospitals, (often patients are more critical and have co-morbidities)
- The level of teaching intensity has a bearing on the cost per case in teaching hospitals and it is for these reasons that teaching hospitals demonstrate a higher cost then non-teaching facilities.

The Balanced Budget Act of 1997 introduced a number of changes to the funding of medical education that were historically enjoyed by AHC and teaching hospitals. The effect on AHCs and teaching hospitals was disproportionate, resulting in large reductions in funding allocations to many of the hospitals. One of the key sections of the Act was to freeze the number of interns and residents that Medicare would support, limiting the number available to be used in calculations for both the direct medical education and indirect medical education. Hospitals that increased the

size of their medical education programmes outside this cap would receive no additional payments (Reuter 1997).

A recent report written by 'The Commonwealth Fund' (2009), documents a strategy 'to provide a better performing healthcare system looking towards 2020'. This report offers recommendations for insurance, payment, and system reforms, however fails to mention any change in current methods of funding teaching and research in US hospitals.

Very little literature was identified providing insight into how research grants are treated in relation to direct and indirect teaching payments. However, due to mounting pressure to reduce costs, AHCs are 'streamlining' their clinical research activities in an effort to reduce costs and improve responsiveness to funders. Some AHCs are organising their own non-profit, internal contract research organisations (The Commonwealth Fund 2000; The Commonwealth Fund 2003).

3.3.3 Canada

In Canada population needs based funding is the preferred funding methodology for many jurisdictions. Capitation is the dominant mode of payment in a population needs-based funding methodology (Finnerty 1996; Bedard, Dorland et al. 2000). Hurley et al. discuss approaches to capitation for integrated health systems and note that research and education should not be funded through enrollee capitation.

In Canada research or teaching hospitals receive specific support under the terms of the 2003 Accord on Health Care Renewal (Department of Finance Canada 2008).

The Canadian Institutes of Health Research (CIHR) is a lead funder of health research. It acts as an arm's length agency of government and it is accountable to Parliament through the Minister of Health. In fiscal year 2008-2009, CIHR is planning to invest over $960 million in research projects and personnel support across the full spectrum of health sciences research (Canadian Institutes of Health Research 2008). This organisation categorises health research in four themes: bio-medical research; clinical research; research respecting health systems and services; and research into the health of populations, societal and cultural dimensions of health, and environmental influences on health (Canadian Institutes of Health Research 2009).

Paige (2007 '.p1057) explains how in Canada hospitals have become the driving force in health research.

> *The Association of Canadian Academic Healthcare Organisations, which represents 50 research hospitals across Canada, estimates that more than 75% of publicly funded health research — amounting to more than $2 billion — is spent annually within hospital-based institutes and centre.*

One of the main issues he discusses is how grants do not cover the indirect costs of research. It is noted that the Canadian federal government instituted a component for indirect-cost allocation several years ago. However, it then applied a sliding-scale formula that resulted in a premium of less than 20% on grants awarded to the institutions undertaking the largest share of federally funded research. The Canadian Foundation for Innovation from 2007/08 has provided funding for Canadian hospitals and universities to strengthen their research enterprises and this along with the Canada Research Chairs Program has strengthened health service research. Paige (2007) also comments on the misconception that universities cover the operating costs of research conducted in hospitals.

3.3.4 New Zealand

The New Zealand department of health use a Population Based Funding Formula (PBFF). This is an aggregate formula used to determine the share of funding to be allocated to different areas of the country, based on the population living in each area. The PBFF does not determine the overall level of funding. The overall level of funding is determined by the Budget process based on

Government spending priorities. The PBFF model is designed to distribute available funding fairly between District Health Boards, according to the relative needs of their populations and the cost of providing health services to meet those needs. The PBFF gives each District Health Board the same opportunity for resourcing to respond to the needs of its population.

The New Zealand Government reports separately on education and training of health personnel and research and development in health. (Ministry of Health 2008)

The Ministry of Health in New Zealand provides Maori support through funding grants for trainees enrolled in Clinical Training Agency funded training programmes (New Zealand Ministry of Health 2009).

Information on the current application of casemix funding models within New Zealand was not readily accessible via the internet.

3.3.5 Europe

The literature relating to international applications of a resource distribution formula addressing teaching and research is grounded in some well cited works produced in the late 1990s and early 2000 (Lopez-Casasnovas and Saez 1999; Huttin and De Pouvourville 2001; Mossialos, Dixon et al. 2002). Lopez-Casasnovas (1999) analysed systematic difference in the costs of teaching hospitals in Spain. Their results show that costs are 9% higher (15% in the case of median costs) in teaching than in non-teaching hospitals. That is, teaching status legitimately explains no more than half of the observed difference in actual costs. The impact on costs of the teaching factor depends on the number of residents. From a policy making point of view, they conclude that since a higher relative burden for medical training falls on public hospitals, an explicit adjustment for the extra costs that the teaching factor imposes on hospital finance is needed.

The study by Huttin and De Pouvourville (2001) assesses the impact of teaching and research on the average adjusted cost per stay of French public hospitals. This study used data from 1994 for 144 public and private hospitals. The authors found that research and teaching have an impact on the differential of costs between university hospitals and others. Huttin et al. (2001) discuss the influential work of Pettengill and Vertrees who designed the first explanatory study that led to the determination of a compensation by Medicare of additional costs induced by teaching, measured by the ratio of intern and resident-to-bed ratio (in the United States). They note that previous studies in French teaching hospitals discuss the view that the low wages of residents and interns offset the potential extra costs linked to time devoted by senior physicians to training and inefficient prescribing of drugs, laboratory tests and X-rays by postgraduate and graduate medical students.

Huttin et al. (2001 ,p.52) summarise their major findings as follows:

> *'Results on teaching confirm former studies showing a significant impact of training, measured by the ratio of trainees to beds, on costs. Moreover, we confirm what previously quoted authors have suggested, i.e., that there is a threshold effect: under a given density of trainees, they contribute more to care than they cost because of training. Results on research are consistent with predictions of higher costs. However, we also observe that there is an important variance both of the production of research among research and teaching hospitals, suggesting that a uniform rate of 13% will not equitably compensate for each structure'.*

Mossialos et al. (2002) provide a detailed overview of options for funding health care in Europe. There is an excellent summary of resource allocation methods use in twenty countries in Western Europe with a particular focus on capitation and risk adjustment. There is no specific discussion of funding options for the functions of teaching and research.

3.3.6 Scandinavia

The work of Linna and Hakkinen is the most widely cited material describing the approach to teaching and research costs in Scandinavia. The authors focus on Finnish hospitals and first published on this topic in 1998 with an econometric study of the costs of teaching and research (Linna, Hakkinen et al. 1998). In this study the authors used stochastic frontier cost functions to estimate the teaching and research costs of Finnish hospitals.

> *Teaching and research may increase the costs of hospitals both directly and indirectly. Direct costs are additional investments sunk in teaching and research programs, lecture rooms, research laboratories and equipment. An indirect influence of teaching and research is the loss of labour productivity in patient care; students and research projects absorb the time of the professional personnel. The more students in relation to professionals, the more time for teaching is needed.* (Linna, Hakkinen et al. 1998, p. 296)

The main policy implication of this study is that university teaching hospitals are able to produce both teaching and research output at significantly lower marginal and average incremental costs than other hospitals, probably due to economies of scale. According to their results 55% of the Finland's total state reimbursement budget for teaching and research should be allocated to teaching and 45% to research. Linna et al. (1998) provide a brief review of teaching and research costs in the literature. At this time they raised the 'mixed or joint product nature' of education and health care and how this makes any accounting approach to allocate costs between education and patient care essentially arbitrary. They advocate the use of econometric models to determine indirect costs. In their literature review they summarise some of the proxy measures used for teaching and research effects such as:

- Medical school affiliation
- Approved residency programs
- Membership on a Council of Teaching Hospital
- Teaching hospital status
- Number of medical students and nurses in training etc.

Linna et al. (1998) could find no evidence of a separately specified research variable. They note that most estimates of the overall impact of teaching and research on hospital costs lie between 7 and 15%.

Linna et al., (2006) published a further study in this area where the stochastic frontier cost function was used to estimate the teaching and research costs of Finnish hospitals. The results suggest that the average rate of teaching and research reimbursement should be approximately 14.6% of the total operating costs in university teaching hospitals. The main finding was that the university teaching hospitals were underfunded with respect to both research and teaching output.

The Norwegian Directorate of Health and Social Affairs funded a study to estimate the costs of professional development activities in health organisations (Bjork, Torstad et al. 2009). The authors comment on the proliferation of Continuing Professional Development (CPD) programs as a strategy for modernising health services. They produce a cost estimation model to understand the true costs of CPD in the Norwegian context.

Within the limits of our literature review we did not find any additional factors that would impact on the approach to understanding the costs of teaching and research in the NSW context.

3.4 Australian Approaches to Recognising the Costs of Teaching and Research

All Australian State and Territory web-sites were searched for relevant population based funding resource allocation models that address the issue of teaching and research compensation. Our practical experience in working with other jurisdictions had lead to a focus on Victoria and South

Australia as these States (in addition to NSW) have contributed most to the debate. The information relating to NSW Health's approach to resource allocation and the direct and indirect costs of teaching and research are not repeated in this section of our report, as relevant information has previously been provided.

3.4.1 South Australia

The South Australian Department of Health has used casemix as the primary resource allocation tool within the South Australian public health system since July 1994. Whilst updates to the base data that underpin the various components of the model are routinely performed, wholesale changes to the calculations or methods for deriving the components are not made unless there is a proven need and a substantial benefit.

Teaching, learning and research are funded through a:

- Teaching grant
- Research grant
- Clinical development grant.

The teaching grants apply differentially to nursing, medical officers and other health professionals. For example, in 2008/09 the medical officer teaching grants were based on 2005–06 workforce numbers with the grant calculated on the basis of a training component for the training medical officer; a supervisory component for the visiting medical officer/salaried medical officer time; and a supervision allowance for medical undergraduates. The nurse teaching grant has been updated to reflect the approved number of professional development programs/courses for 2008-09. Allied health professionals professional training costs are compensate for with a grant. Whilst the actual cost has not been measured, in 2008/09 the grant was calculated on the basis of 5% of the salaries and wages cost for these staff groups.

South Australia provides infrastructure funding for program and project research grants supported by the National Health & Medical Research Council (NH&MRC) grants. For those research grants not in the name of the hospital, infrastructure funding is considered where the principal researcher is an employee of the hospital, or in the case of clinical academics, the research is relevant to the clinical workload of the hospital. The research grant is indexed and in 2009/09 was calculated on the basis of 41.44 cents for each research dollar.

In 2008/09 the South Australian Government allocated $10.35m as a clinical development grant, pro rata across metropolitan hospitals on the basis of the number of scientific officers, consultants and visiting medical specialists employed by each hospital.

South Australia does not have a separate complexity component with funding rates set to reflect the total per diem costs for intensive care services after allowing for teaching, research and clinical development (South Australian Government 2008).

3.4.2 Victoria

The Victorian Health Service introduced the 'Training and Development' grant into the original casemix formula to recognise that there were additional costs (both direct and indirect) inherent in the teaching, training and research activities of teaching hospitals.

The 'Victorian Health Services Policy and Funding Guidelines 2009-10' describe the make up of the grant, which is comprised of four streams of funding: complexity, research, early graduate and workforce priorities and strategy (State Government of Victoria 2009p.1).

The model makes the assumption that facilities providing undergraduate and postgraduate education have a more complex and hence more expensive patient mix in comparison to other

non-teaching hospitals. The Department of Human Services recognises that DRGs have limitations in measuring complexity; as a result the 'Teaching and Development Grant' was introduced to compensate for the complexity of workload as well as teaching, training and research activities (State Government of Victoria 2009)

The formula used for allocating complexity related funding was updated by the Department during 2009. This was to ensure that the latest inpatient and cost data were included in the complexity allocation formula. The complexity component of the T&D grant is based on a share of complex WIES within DRGs (State Government of Victoria 2009). As part of an ongoing review of specified and complexity-related grants, the Department will allow health services to retain other complexity-related grants (e.g. WIES stabilisation grants) in the first instance, but these will be considered for clawback when any other policy changes result in a positive outcome for the health services (including the application of the updated complexity formula).

The Victorian formula for allocating the complexity component of the 'Training and Development Grant' has been remodelled for 2009/10 to ensure the latest inpatient and cost data were included. The complexity allocation formula includes:

- Identification of complex DRGs
- Identification of complex cases within each complex DRG (accounts for 30% of costs in this component)
- Estimating each hospital's share of Weighted Inlier Equivalent Separations (WIES) associated with complex patients in complex DRGs (a hospital is ranked for complex transfers) (Brophy 2009)

Research infrastructure grants are also provided to the major teaching hospitals as part of the 'Training and Development Grants' and $23million will be allocated in 209/10.

In Victoria, administration of operational infrastructure support for biomedical research institutes is the responsibility of the Department of innovation, industry and Regional Development (DIIRD) Early graduates funding provides payments to health services to contribute to the cost of supervision and on-the-job training in the first year for nursing and allied health graduates and the first two years for medical graduates. Some allied health students undertaking professional practice placements are also supported through this stream.

In addition the workforce priorities and strategy component supports undergraduate clinical placements and nursing postgraduate education. The number of funded positions supported by the 'Training and Development Grant' is limited by the total grant pool. In 2009/10 the Training and Development Grant payments ranged from $3,712 per post-graduate midwifery nurse – clinical placement model to $34,455 for a Medical Postgraduate Year 2 (State Government of Victoria 2009).

The Victorian model for Activity Based Funding is currently under review with the development of a common framework for treatment of training, research and development due at the end of 2010/11 (Brophy 2009).

3.4.3 Queensland

Queensland Health supports the allocation of funding based on population need (Resource Allocation Model) and service activity (Casemix), (Queensland Government 2007). It continues to refine the 'Queensland Health Casemix Funding Model'. In 2009/10 the approximate size of the Queensland Health budget is $9billion with approximately $5billion of this linked to activity and output targets through casemix funding. (Stomfay 2009). Refinements to the funding model occur through the 'Funding Model Technical Advisory Group'. The Queensland Health Casemix Funding Model consists of seven components: acute inpatients (DRG only), critical care, mental health, non-acute, emergency departments, outpatients and clinical education. In 2008/09 clinical

education accounted for 3% of the total casemix funding model (all components). The inpatient funding component includes a 10% loading for tertiary DRGs in addition to DRG payments.

The clinical education component is derived from three separate pieces of information:

- Graduate Funding
  - % of salary per graduate position e.g. a Medical Intern is counted (01) @ 50% salary and an Enrolled Nurse (01) @ 40% salary.
- Undergraduate Funding
  - Price per student week (Allied Health $125, Dentistry $341.55, Medical $341.55 and Nursing $125)
- Jointly appointed Clinical Academics ($5million pa across all Health Districts) (Stomfay 2009)

The Queensland Government has recently introduced the 'Clinical Academic Fellowship' with Round One commencing in 2010. This fellowship provides salary 'top up' funding for full-time clinical academics. This initiative is part of the Health Research Fellowship Program and is administered by the Office of Health and Medical Research, part of the Centre for Healthcare Improvement in Queensland Health. The objectives of the Fellowships are to increase the presence of full-time clinical academics in Queensland's publicly funded hospitals and health care facilities. The fellowships will be awarded in 2010, 2011 and 2012, with a minimum of twelve Clinical Academic Fellows appointed over that time. These will be new positions and the Fellowship will contribute up to $75,000 top-up funding for the salary for the position for five years (Queensland Government 2009). In addition to the 'Clinical Academic Fellowship', Queensland Health is investing in Senior Clinical Research Fellowships and Health Research Fellowships (open to medical, nursing and allied health personnel) (Mortimer 2009).

3.4.4 Tasmania

The size of the public health sector in Tasmania means that this State is not a significant contributor to the resource distribution debate. Tasmania has three major public hospitals, the Royal Hobart Hospital, Launceston General Hospital and North West Regional Hospital; with a supporting network of rural hospitals and multipurpose services across Tasmania.

The Department of Health and Human Services has been engaged in a comprehensive planning process that has resulted in the publication of Tasmania's Health Plan - a blueprint for the reform of Tasmania's health services into the future. A stated aim of this process is the development of a resource allocation model for health services that will maintain and improve equity of resource distribution between regions. This was completed in August 2009 but is not publicly available (Department of Health and Human Services 2009).

3.4.5 Northern Territory

A review of the Northern Territory (NT) government web-site was completed with particular focus on the NT Department of Health and Families. Whilst references were found relating to resource and activity based funding methods, no guidelines detailing the methodology of this process were publicly available.

The NT has six hospitals and of these, only the Royal Darwin Hospital is a teaching and referral hospital. Consequently the NT does not have the same issue as other States with multiple teaching hospitals, competing for additional funds for teaching and research.

The NT is the only Australian State or Territory without its own medical school, necessitating partnerships with interstate educational groups. The NT has two programs, the NT Clinical School and NT Rural Clinical School programs, which are specifically designed to address workforce supply in the NT. The NT Clinical School is funded by (what is now known as) the NT

Department of Health and Families ($1.595M), Flinders University ($250K) and James Cook University ($170-200K). The NT Rural Clinical School is funded by the Australian Government Department of Health and Ageing for $1.4M pa plus $7.1M for infrastructure. There are a range of scholarships , for example, the John Flynn Scholars that are also funded by the Department of Health and Ageing (Dade Smith J and Wolfe C 2008p.12)

Research is undertaken by the Department of Health and Families as well as external organisations such as the Menzies School of Health Research (MSHR) and the Cooperative Research Centre (CRC) for Aboriginal Health, which have multi disciplinary research programs. The total Departmental budget for health research in 2008-09 was $5.91M (Department of Health and Families 2009p.133).

3.4.6 Australian Capital Territory

The scale of the public health sector in ACT means that this territory is not a significant contributor to the resource distribution debate. The Canberra Hospital is the largest public hospital in the region and is a teaching hospital of the University of Canberra and the Australian National University Medical School and is affiliated with a range of other tertiary institutions.

ACT Health is continuing to implement the ACT Health and Medical Research Strategy with a view to enhancing the health and medical research effort in the Territory. The ACT Health and Medical Research Support Program is intended to provide support to ACT health and medical researchers to boost research activities within the sector. The funding allocation for this initiative is not significant and goes directly to organisations, including hospitals (ACT Health 2009).

3.4.7 Conclusions

There is recognition in the literature that teaching and research occurs in settings other than teaching hospitals, particularly with the growing international focus on primary health care. The Australian Government remunerates General Practitioners directly for teaching medical students, through Practice Incentive Payments.

The lack of explicit funding streams for medical education (and research) in hospital budgets and Australian Health Care Agreements has meant, in the view of Medical Deans, that public hospitals have been able to shift much-needed funds away from teaching and research to meet the increasing costs of service delivery. The Medical Deans of Australia have lobbied the National Health & Hospital Reform Commission for recognition of the true costs of medical education and research.

3.5 Key Messages from the Literature

3.5.1 Summary of the international literature on factors relevant to direct and indirect teaching and research costs

- The majority of developed countries reviewed do provide an additional allocation to compensate teaching hospitals for the costs of teaching and research (France, Finland, Scotland, England, US, Canada, New Zealand and Australia)
- Indirect and direct costs of teaching and research are funded. Indirect payments reflect the higher cost per case observed in teaching hospitals that cannot be specifically allocated to medical education programs. Proxy measures are used for the indirect costs of teaching and research. For example relating the difference in costs between major teaching hospitals to the number of students taught and then calculating the median excess cost per student (as in the NHS)
- Most direct cost measures rely on data relating to numbers of employees in ‘training’ positions, student numbers alone are seen as too simplistic a measure

- One of the fundamental problems associated with identifying these costs, and trying to disaggregate them from patient care, research and postgraduate medical education, is that conceptually they are 'joint products' or 'mixed products'. There may be several outputs from one episode of patient care i.e. teaching is not the only output (Young 2003).
- Teaching hospitals are consistently reported to be more costly than non teaching hospitals
- Several reasons are provided in the literature to explain these differences that are generated by teaching medical students, supporting research, providing further training of doctors and providing specialised care e.g.
    - Complexity of casemix (due to their role as centres for tertiary referrals)
    - Staff profiles (richer skill mix, higher staff to patient ratios to accommodate staff time with students)
    - Inefficiency (teaching hospitals have high unit costs in comparison to non-teaching hospitals)
    - Intensity of treatment (e.g. higher pathology costs, above average quality of care, or is this more complex treatment of straightforward cases?)
    - Specialised care (higher infrastructure costs in hospitals with a concentration of specialised expertise)
    - Stand-by capacity (teaching hospitals provide 'on-call' services for a wider range of sub-specialities)
    - Size and scale of hospitals (economies of scale are lost beyond a certain size)
    - Location of hospital (metropolitan locations are more costly - higher staff, buildings and maintenance costs)
    - Higher than average morbidity in their catchment areas (due to inner city deprivation) resulting in greater and more complex demand for general hospital services and ED
    - Revenue impact (lower numbers of privately insured patients accessing tertiary services, teaching hospitals have historically been associated with care of the poor in the US)
    - Infrastructure (teaching space, libraries, equipment)
    - Additional hotel facilities for students, catering, accommodation etc (Sloan and Valvona 1986; Newhouse and Wilensky 2001; Koenig, Dobson et al. 2003; Newhouse 2003; Spollen M, Dixon P et al. 2003; Standing Committee on Resource Allocation NHS Scotland 2003; Kane, Bershadsky et al. 2005; Zeidel, Kroboth et al. 2005; Lambiase and Harrison 2007; Williams, Matthews et al. 2007)
- Most of the seminal literature relating to the costs of teaching and research in hospitals is old and was published in the late 1980s and 1990s. The most progressive international literature comes from the UK and US
- Studies to estimate cost differences and their causes fall into two broad groups: bottom-up approaches that study the processes of teaching and the resources required and top-down studies that focus on the differences in the costs of patient care between teaching and non-teaching institutions (Scottish Executive Health Department 2005)
- One of the most useful references found is "Research on Additional Costs of Teaching in NHS Scotland: Report for Standing Committee (http://www.scotland.gov.uk/Publications/2004/03/19120/34750)
- This paper provides a summary from the literature of the estimates of additional costs in teaching hospitals (adapted and expanded from Linna et al. 1998), the range of additional cost estimates for teaching hospitals in the US extends from 0-25%; Spain 3-11.1%, Finland 15%, England 4 – 43% (these studies were published from 1983-1996)
- The focus in the resource allocation literature has shifted from population-needs based funding models to mechanisms for capitation and risk adjustment. We could not find any substantive

references to adjustments to these models to accommodate teaching and research costs for the 'managed' population

- There is a consistent trend in the international literature that countries are trying to better understand the true costs of teaching and research and this is being driven by cost rationalisations (e.g. the US Balanced Budget Act of 1997)
- Some experts argue that by basing payment on more refined casemix measures, major teaching hospitals will receive adequate compensation for the services they provide
- In the UK there is advocacy to move away from paying the medical service increment for teaching (SIFT) on the basis of proxy measures of teaching costs towards reimbursement on the basis of 'demonstrated costs'
- The international literature supports the view that subsidies to teaching hospitals that are unrelated to the costs of teaching are unfair and create inefficiency and inequity in the care of patients.

3.5.2 Summary of other Australian jurisdictional approaches to direct and indirect teaching and research costs

- There is recognition in the literature that teaching and research occurs in settings other than teaching hospitals, particularly with the growing international focus on primary health care. The Australian Government remunerates General Practitioners directly for teaching medical students, through Practice Incentive Payments
- Victoria, South Australia and New South Wales have done most work in analysing the teaching and research costs of hospitals
- South Australia's casemix funding guidelines explain the provision of Teaching Grants. (The medical teaching grant is based on 2005–06 full time equivalent staff data and the nurse teaching grant has been updated to reflect approved number of professional development programs/courses for 2008-09)
- A grant is provided to compensate hospitals for professional training costs incurred for allied health, dental, scientific and technical staff. The actual cost has not been measured. In 2008-09 the grant has been calculated on the basis of 5% of the salaries and wages costs for these staff groups
- South Australia provides infrastructure funding for program and project research grants supported by the National Health & Medical Research Council (NH&MRC) grants. For those research grants not in the name of the hospital, infrastructure funding is considered where the principal researcher is an employee of the hospital, or in the case of clinical academics, the research is relevant to the clinical workload of the hospital. The research grant is calculated on the basis of 41.44 cents for each research dollar
- South Australia also funds a clinical development grant. In 2008–09, $10.35M was allocated pro rata across metropolitan hospitals on the basis of the number of scientific officers, consultants and visiting medical specialists employed by each hospital
- South Australia has set funding rates to reflect the total per diem costs for intensive care services after allowing for teaching, research and clinical development
- The Victorian Health Services Policy and Funding Guidelines 2009-10 describe the 'Training and Development Grant' (T&D Grant) which was introduced into the original casemix formula to recognise the additional costs inherent in the teaching, training and research activities of teaching hospitals. It comprises four streams of funding: complexity, research, early graduate and workforce priorities and strategy
- During 2009 the Department undertook work to update the formula for allocating complexity-related funding. This work involved updating the complexity allocation formula to include the latest available inpatient activity and cost data

- The Victorian model assumes that health services that provide undergraduate and postgraduate education to health professionals have a more complex and a more expensive patient mix than other hospitals. It is recognised that DRGs have limitations in measuring complexity so the T&D Grant was introduced to compensate for the complexity of workload as well as teaching, training and research activities
- The complexity component of the T&D grant is based on a share of complex WIES within DRGs and the activities funded under the T&D grant have been inextricably linked to clinical hospital services
- As part of an ongoing review of specified and complexity-related grants, the department will allow health services to retain other complexity-related grants (e.g. WIES stabilisation grants) in the first instance, but these will be considered for clawback when any other policy changes result in a positive outcome for the health services (including the application of the updated complexity formula)
- The Victorian formula for allocating the consolidated complexity funding pool (T&D complexity grant plus the interpreter services grant) requires three steps:
  - Identification of complex DRGs
  - Identification of complex cases within each complex DRG
  - Estimating each hospital's share of WIES associated with complex patients in complex DRGs (a hospital is ranked for complex transfers).
- In Victoria, administration of operational infrastructure support for biomedical research institutes is the responsibility of the Department of innovation, industry and Regional Development (DIIRD)
- Research infrastructure grants are also provide to the major teaching hospitals as part of the T&D Grants and $23 million will be allocated in 2009-10
- The early graduates' stream provides payments to health services to contribute to the cost of supervision and on-the-job training in the first year for nursing and allied health graduates, and the first two years for medical graduates. Some allied health students undertaking professional practice placements are also supported through this stream
- The lack of explicit funding streams for medical education (and research) in hospital budgets and Australian Health Care Agreements has meant, in the view of Medical Deans, that public hospitals have been able to shift much-needed funds away from teaching and research to meet the increasing costs of service delivery. The Medical Deans of Australia have lobbied the National Health & Hospital Reform Commission for recognition of the true costs of medical education and research.

3.6 Implications for Review of the NSW RDF Direct and Indirect Teaching and Research Factors

The literature review confirms that the general approach undertaken in the current version of the RDF is consistent with international approaches. There are some differences between countries and jurisdictions in terms of the technical detail and in the importance given to different elements. Perhaps the biggest difference is that many other countries include a direct measure of the number and type of students taught in their models. Another is that many countries explicitly recognise the additional costs of 'stand-by capacity' whereby teaching hospitals incur additional costs because they need to provide 'on-call' services for a wider range of sub-specialities. In the current version of the NSW RDF 'stand-by capacity' is subsumed within the indirect teaching and research factor.

However, the literature review has not identified any significant new developments that might influence the modelling approach for the NSW RDF direct and indirect teaching and research factors.

4 Consultation Process

The consultation process has been two-fold. The first stage of consultation has centred on other Australian jurisdictions. The second stage of consultation has been focused within NSW

4.1 Australian Jurisdictions

Telephone interviews were completed with State Government officers from South Australia, Victoria and Queensland as these States, along with NSW, have done most work in analysing the teaching and research costs of hospitals. Any relevant findings have been included within the literature review.

4.2 NSW Stakeholders

Two teleconferences were held with representatives from the NSW Department of Health and each of the eight NSW Area Health Services. These teleconferences aimed to gather feedback and comments on a range of factors prior to the first round of data modelling. The first consultation process generated a range of issues that were then explored directly with 'experts' in the relevant field. A follow-up consultation session was held to resolve the parameters for modelling.

5 Recommended changes to the NSW RDF Direct and Indirect Teaching and Research Factors based on the literature review and the consultations

The following changes are recommended based on the consultations we conducted as part of the review. They largely reflect suggested approaches as flagged in our earlier background paper that was distributed to Area Health Service representatives who participated in the consultations. These changes (and in some cases other options) are modelled in the next section.

5.1 Intensive care

It is recommended that the full cost of care for Intensive Care (IC) patients (not High Dependency patients) in designated ICUs (as per the Episode Funding Guidelines) continue to be built into the RDF. This not only acts as a proxy for clinical complexity that cannot adequately be explained by the DRG classification, it also recognises and reinforces that ICUs are resources for the whole of the health system and not simply the Area in which they are located.

It is further recommended that the cost of IC be moved out of the Teaching and Research component of the RDF and into the Acute Care component of the RDF. Under this approach, care for IC patients would be treated as a statewide service within the Acute Care component.

5.2 Direct Teaching, Research and Learning component

It is recommended that the current approach whereby the cost of designated teaching, learning and research related positions with proportional weightings continue to be built into the model. These staff positions are based on staff profiles as reported through the HIE rather than those reported to the Department under the Teaching and Research program.

The only change recommended is in relation to the weighting for Clinical Academics. These positions had a weighting of 1.0 in the last version of the RDF. It is recommended that this be reduced to 0.8 to recognise that these positions do provide patient care.

Under this approach, the RDF share for each Area is in proportion to weighted teaching, learning and research related FTE positions in all settings, including community health and mental health.

The wording of the 2007 RDF report implies that staff FTE is built into the model based on actual cost. For example, on page 59 it says “By including actual staff costs in this part of the formula, the relative disadvantage faced in the funding of clinical academic staff is recognised”.

However, this is not correct. The actual model in the previous version is as follows:

- The fund pool for distribution is equivalent to the cash (not Net Cost of Service) share of the NSW Teaching and Research Program (Program 6.1). In 2007/08, $319,882,000 or 3.83% of total Area Health Service cash allocations were reported under Program 6.1. By way of comparison, the net cost of service for Program 6.1 was $345,524,000 but this includes SP&T funds.
- This $320m forms the funding pool for allocation under the Direct T&R component of the RDF
- This pool is then distributed based on a blended index of share of HCCC and share of Program 6.1 expenditure. The index is the mean of these two elements.

The current RDF policy argues that, as a matter of principle, the direct teaching and research component of the RDF should not be based on the level of expenditure reported by Area Health Services, particularly when this has been shown to be highly variable and subject to different interpretations, as it would create an incentive for over reporting. It thus includes the share of

HCCC activity as a second element. The 2007 report argues that, while this is not a direct measure of teaching and research activity, its derivation is based on the DRG activity that tends to be concentrated in teaching hospitals and, over time, it has shown correlation with teaching and research expenditure.

It is recommended that HCCC activity no longer be included in the calculation of the direct component. Data systems have improved in recent years and the issue of incentives to over-report is easily addressed if staff data are extracted from payroll data (HIE State staff award tables) rather than based on reports by Areas.

It is important to note that the direct teaching and research component of the RDF covers all programs (including community and primary care and mental health) and not just acute care. Further, while HCCC activity is correlated with teaching and research expenditure, there are differences between Areas as illustrated by Figure 2 (page 27). These two reasons provide further justification for no longer incorporating a measure of HCCC in the direct component.

5.3 Indirect Teaching, Research and Learning component

On the assumption that the above recommendation to transfer the IC component to the acute program section of the RDF, the indirect Teaching and Research component of the RDF would cover:

- The indirect cost of teaching, research and learning.
- After controlling for casemix and IC provision, any residual differences between hospital peer groups in the cost of acute care. This last indirect element recognises three factors as legitimate causes of cost differences between hospital peer groups:
  - Within-DRG clinical complexity differences.
  - The cost of 'joint product' or 'mixed product' services in which patient care, research, teaching and learning are delivered together and cannot be separated.
  - Stand-by capacity (the more complex the casemix, the greater the need to provide 'on-call' services in a wider range of sub-specialities).

It is recommended that the distribution of these funds include the BM and BNM groups. Distributing some of these funds to the BM and BNM groups assumes that at least some of the cost differences are due to differences in efficiency between the peer groups. This is a fundamental departure from assumptions in the previous versions of the RDF.

The current version of the RDF is based on case weighed, not raw, share of HCCC. Whether or not to continue this approach is one of the issues for resolution in this current review. All HCCC activity is, by definition, high cost and complex and concentrated in a small number of hospitals. The purpose of incorporating HCCC activity into this component of the RDF is not to recognise the cost of this care but because it is a proxy for indirect teaching, research and learning costs and a proxy for differences in clinical complexity that cannot be explained by DRG. The case weighted approach assumes, for example, that a separation with a case weight of 10.0 has twice as much mix product care (teaching, research and clinical care that cannot be unpacked) and has twice as much unexplained complexity as a separation with a case weight of 5.0.

A case weighted approach has an inherent bias in favour of surgical DRGs relative to medical DRGs because of the high cost of the operating theatre component in the case weight. This is illustrated in Table 3, which shows average cost weight by type[2].

[2] This table differs from the equivalent table in an earlier background paper we issued because 6 DRGs have since been re-classified from HCCC to non-HCCC.

Table 3 Average DRG cost weight by DRG type and whether or not HCCC

DRG type	HCCC?		All
	No	Yes	
Surgical	1.29	3.24	2.27
Medical	0.60	3.18	1.89
Other	0.50	0.76	0.63
All	**0.78**	**3.18**	**0.88**

As seen in Table 4 below, the HCCC list is already heavily loaded with surgical DRGs, with surgical DRGs representing 82% of the total list. On a raw basis, surgical DRGs represent 65% of HCCC activity. This increases to 81% on a case weighted basis.

Table 4 Number of DRGs by DRG type and whether or not HCCC

DRG type	HCCC?		All
	No	Yes	
Surgical	175	106	281
Medical	325	20	345
Other	33	4	37
All	**533**	**130**	**663**

However, it is also the case that those hospitals with the capacity for very high cost and complex surgery have the highest 'stand-by' and 'on-call' costs as they have more surgical and medical sub-speciality departments, each with their own training programs, on-call rosters and research programs. While their direct costs are taken into account in the direct teaching and research component of the RDF, their indirect costs associated with capacity also need to be accounted for.

Regardless of how HCCC is measured, it is recommended that this component no longer continue to be based on HCCC for local residents only. This component of the RDF is designed to address differences in case complexity not adequately dealt with by the DRG classification. The same issues apply whether the patient is local or not. Nevertheless, in Table 37 to Table 42 in Appendix 2, results are presented using activity for local residents only as this is the approach adopted in the previous version of the RDF.

5.3.1 Indirect research costs

Another potential metric in the indirect component is external research funding. None of the NSW health entities has attracted Australian Research Council (ARC) funding in recent years and so the analysis in the next section is based solely on NHMRC funds.

6 Results

6.1 Intensive Care

As shown in Table 5, the Intensive Care (IC) component has increased from $288m to $381m and the major non-metropolitan hospitals are delivering an increasing share. Intensive care data are not available for the 5 years in the series reported for other components and so the results below are based on 2007 and 2008 calendar year activity data and 2009/10 costs.

Table 5 Percentage share of Intensive Care funding by peer group (2009/10 Episode Funding Model)

2009 Peer Group	% share
A1 Principal referral	71.7%
A2 Paediatric specialist	4.1%
A3 Ungrouped acute	1.7%
BM Major metropolitan	10.8%
BNM Major non-metropolitan	11.6%
Total	**100.0%**

Costs in the table above and in Table 6 below have been adjusted for four hospitals in the North Coast Area Health Service (Port Macquarie, Coffs Harbour, Lismore and Tweed) that could not separately report ICU days for IC and HD patients. This is because the intensive care component in the RDF includes only patients receiving intensive care (nursing ratio 1:1) and not high dependency level care. The cost of IC at the Children's Hospital Westmead has been excluded.

Table 6 Intensive care patient share by Area Health Service

Area Code	AHS	% share
X500	SSWAHS	23.44%
X510	SESIAHS	25.94%
X520	SWAHS	16.87%
X530	NSCCAHS	14.99%
X540	HNEAHS	9.12%
X550	NCAHS	5.06%
X560	GSAHS	2.62%
X570	GWAHS	1.96%
Total		**100.00%**

6.2 Direct Teaching, Research and Learning

Figure 2 shows the share of weighted FTE teaching and research related positions by Area over the last 5 years. While some Areas have maintained a stable share, this is not the case for all Areas. More detail is provided in Table 7.

Figure 2 Share of weighted FTE teaching and research related positions by Area

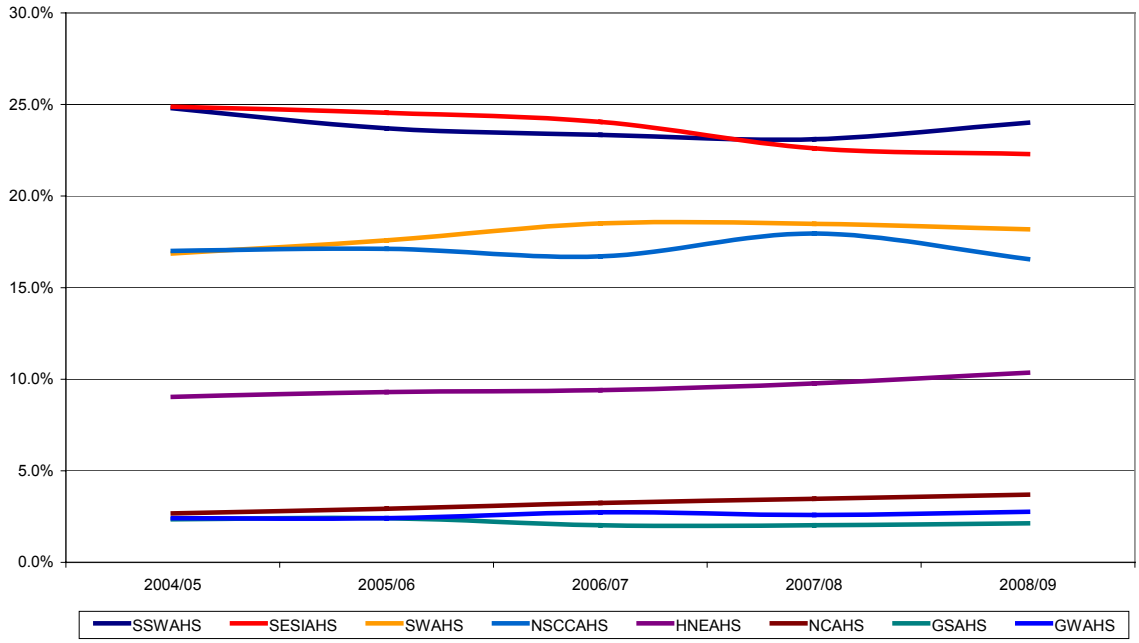


Table 7 Weighted teaching and research related FTE positions by Area Health Service

Year	Area	2004/05	2005/06	2006/07	2007/08	2008/09
X500	SSWAHS	723.4	765.1	815.2	846.6	892.3
X510	SESIAHS	726.4	792.5	839.8	828.3	828.7
X520	SWAHS	492.1	567.5	646.2	677.1	675.8
X530	NSCCAHS	496.3	552.7	583.4	657.8	615.5
X540	HNEAHS	263.7	300.2	328.3	357.7	385.1
X550	NCAHS	78.1	94.8	113.2	127.2	137.7
X560	GSAHS	68.5	77.9	70.8	74.4	79.4
X570	GWAHS	70.3	77.9	95.5	94.7	102.9
All		**2918.7**	**3228.4**	**3492.5**	**3663.9**	**3717.4**
Percentage share						
X500	SSWAHS	24.8%	23.7%	23.3%	23.1%	24.0%
X510	SESIAHS	24.9%	24.5%	24.0%	22.6%	22.3%
X520	SWAHS	16.9%	17.6%	18.5%	18.5%	18.2%
X530	NSCCAHS	17.0%	17.1%	16.7%	18.0%	16.5%
X540	HNEAHS	9.0%	9.3%	9.4%	9.8%	10.4%
X550	NCAHS	2.7%	2.9%	3.2%	3.5%	3.7%
X560	GSAHS	2.3%	2.4%	2.0%	2.0%	2.1%
X570	GWAHS	2.4%	2.4%	2.7%	2.6%	2.8%
All		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

As shown in Table 8, the share of staff in teaching and research positions in rural areas has increased over the last 5 years.

Table 8 Share of FTE in teaching and research related positions in 3 rural areas (Greater West, Greater South and North Coast) versus others

Year	Rural Areas	Other Areas
2004/05	7.4%	92.6%
2005/06	7.8%	92.2%
2006/07	8.0%	92.0%
2007/08	8.1%	91.9%
2008/09	8.6%	91.4%

The implication is that the time period used to calculate each Area's share of teaching and research related positions impacts on the results for some Areas, with the results of four options for measuring each Area share shown in Table 9.

Table 9 Options for measurement of share of FTE in teaching, research and learning related positions in the RDF

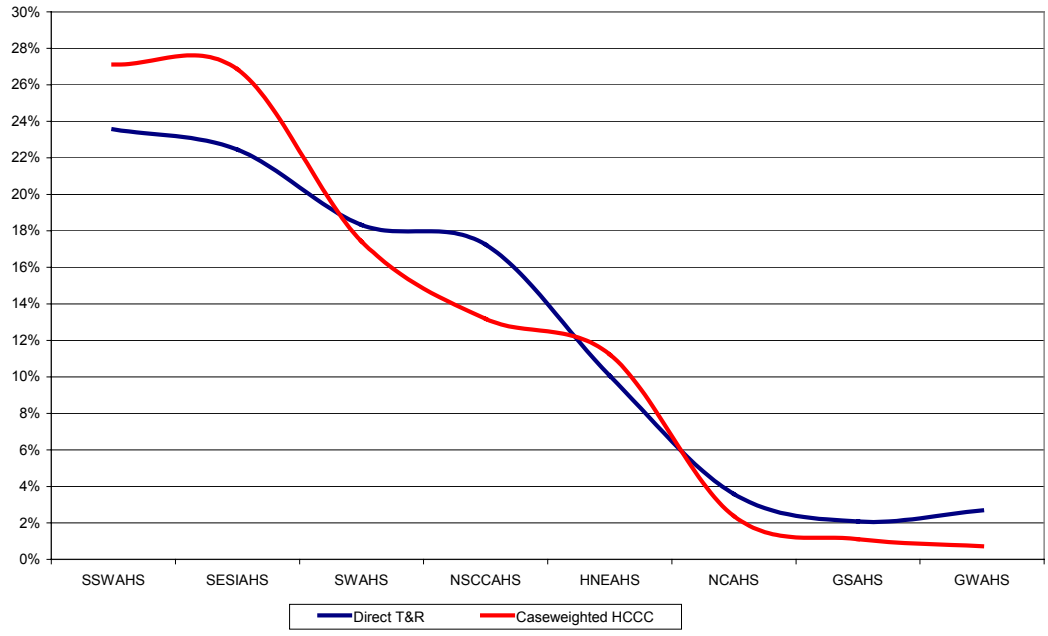
Area		5 year average	Average last 3 years	Average last 2 years	Most recent year (2008/09)
X500	SSWAHS	23.75%	23.49%	23.56%	24.00%
X510	SESIAHS	23.59%	22.96%	22.45%	22.29%
X520	SWAHS	17.97%	18.38%	18.33%	18.18%
X530	NSCCAHS	17.07%	17.07%	17.25%	16.56%
X540	HNEAHS	9.61%	9.85%	10.06%	10.36%
X550	NCAHS	3.24%	3.48%	3.59%	3.70%
X560	GSAHS	2.18%	2.07%	2.08%	2.14%
X570	GWAHS	2.59%	2.70%	2.68%	2.77%
All		100.00%	100.00%	100.00%	100.0%

We recommend that the RDF be based on share of FTE in teaching, learning and research related positions in the last 2 years. Given the changing role of the rural areas, the usual metric of 5 years is too long to use in a formula designed to inform future funding allocations.

The staff FTE analysis cannot be undertaken below the level of the 8 Area Health Services or by peer group. This is because 548 (8.7%) positions across Area Health Services have a facility code other than a hospital. These include 240 registrar positions that are allocated to an Area level code rather than a facility. It also includes positions in areas such as group pathology services, Area-wide mental health and community health services and Area workforce development units.

The previous version of the direct component is based on a blended index that includes a 50% weighting for case weighted HCCC. As shown in Figure 3 below, while the overall measures are correlated, there are differences between Areas.

Figure 3 Relationship between direct teaching and research staff and case weighted HCCC

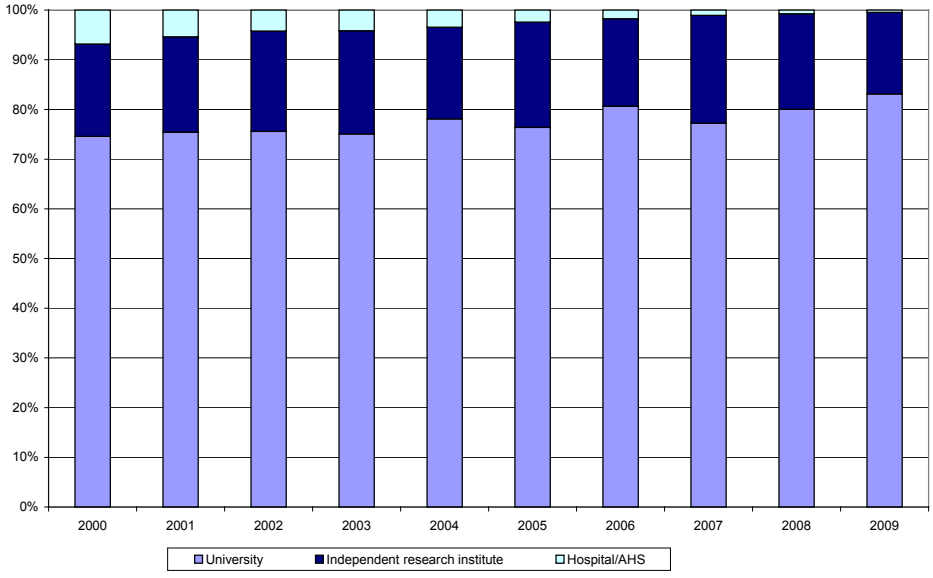


6.3 Indirect Teaching, Research and Learning

6.3.1 Indirect research costs

As discussed in the previous section, one potential metric in the indirect component is external research funding. As shown in Figure 4, the share of NHMRC funding going to hospitals and area health services has been progressively decreasing, with an increasing share going to universities and independent medical research institutes. Both universities and independent medical research institutes can attract indirect research support through the NSW Medical Research Support Program and other sources. As a matter of principle, hospitals and areas channelling research funding through these administering organisations should not receive support through the RDF.

Figure 4 NHMRC funds by sector 2000-2009



That leaves the remaining NHMRC funding administered by hospitals and areas. One possibility for consideration is to build indirect research support for such grants into the RDF. The generally accepted figure in the university sector is 30%-40%. However, given that the total quantum of NHMRC funding now being awarded to hospitals and areas is so small (only $1.1m in total across NSW in 2008), it would have no material effect in the model.

It is therefore recommended that external research funding not be incorporated in the indirect component.

6.3.2 Overall measures of indirect teaching, learning and research costs

As previously described, the current method is based on a blended index based on each Area's share of ICU and each Area's share of HCCC. While the ICU element is distributed among all Areas, the HCCC element is restricted to those Areas containing a Peer Group A hospital. In Section 5.3 we recommended that ICU be separated out and dealt with elsewhere in the RDF, that the residual indirect component be expanded to include the Peer Group B hospitals and that all HCCC activity be counted. The results in this section are based on those recommendations.

A series of different models were developed to find the best proxy measure of indirect teaching, learning and research costs after the ICU component has been removed. These costs are:

- The indirect cost of teaching, research and learning.
- Within-DRG clinical complexity differences.
- The cost of 'joint product' or 'mixed product' services in which patient care, research, teaching and learning are delivered together and cannot be separated.
- Stand-by capacity (the more complex the casemix, the greater the need to provide 'on-call' services in a wider range of sub-specialities).

The starting point in the analysis was HCCC activity in the Peer Group A and B hospitals. This was investigated on both a raw and a case weighted basis. In the process, we analysed each result by DRG type (medical, surgical and other). For some areas, the results of the raw and case weighted approaches were similar but for some Areas the results were significantly different. Further analysis indicated that this was due to the inclusion of the four 'other' DRGs in the HCCC list. Removing the 'other' category from the HCCC list produced results that were more stable. Accordingly, the results reported in this section are based on 126 HCCC DRGs – 106 surgical DRGs and 20 medical DRGs.

Table 10 shows the results of three different options for measuring HCCC in the indirect component. Raw HCCC is the share of separations in each Area. The reason to consider the raw HCCC model is that all HCCC activity is, by definition, high cost and complex and concentrated in a small number of hospitals. The purpose of incorporating HCCC activity into this component of the RDF is not to recognise the cost of this care but because it is a proxy for indirect teaching, research and learning costs and a proxy for differences in clinical complexity that cannot be explained by DRG. The raw HCCC model assumes that every HCCC admission has an equal chance of having clinical complexities that cannot be explained by the DRG.

Case weighted HCCC is the share after weighting each DRG by its cost weight. Apart from the fact that this is the approach in previous versions of the RDF, the reason to consider this model is that those hospitals with the capacity for very high cost and complex surgery have more surgical and medical sub-speciality departments, each with their own training programs, on-call rosters and research programs. The case weighted approach is thus a better proxy for the 'stand-by' or 'on-call' costs associated with, for example, major trauma care.

Table 10 Result of optional approaches for measurement of share of HCCC by Area Health Service

Area		Raw HCCC	Cost weighted HCCC	Medical complexity weighted HCCC
X500	SSWAHS	26.58%	27.12%	25.39%
X510	SESIAHS	29.87%	26.85%	30.73%
X520	SWAHS	15.24%	17.43%	15.13%
X530	NSCCAHS	12.05%	13.18%	11.56%
X540	HNEAHS	11.31%	11.23%	12.00%
X550	NCAHS	2.71%	2.36%	2.96%
X560	GSAHS	1.41%	1.11%	1.44%
X570	GWAHS	0.8%	0.72%	0.79%
All		100.00%	100.00%	100.00%

In the medical complexity weighted model, both raw and case weighted separations in medical DRGs are given a weighting of two and separations in surgical DRGs are weighted at one and the two are averaged. There are two reasons to consider this option:

- As discussed previously, the HCCC is highly skewed in favour of surgical DRGs, with only 20 medical DRGs on the list and weighting medical cases more highly partially addresses this
- Consultations undertaken as part of the review suggested that, overall, high cost, complex medical patients are more likely to receive 'joint product' care and more likely to incur costs that the DRG cannot explain.

We undertook some data analysis in relation to the second dot point above. To investigate the likelihood of patients in medical DRGs staying longer than those in surgical DRGs, the number of days per separation beyond the median, the mean and the long stay trim point for each DRG were calculated. When all DRGs were included, there was some evidence that the days (per separation) beyond each of these statistical reference points tended to be a few days longer for medical DRGs than for surgical DRGs. However, when the analysis was restricted to HCCC DRGs only, that pattern was not only reversed, with the surgical patients staying longer, but the effect was also stronger. This analysis could only identify a difference in the number of days patients stayed; it could not measure any differences in intensity of care or the corresponding costs. It is therefore unclear whether medical episodes should receive a higher weighting in the model.

Table 11 shows results of these options by peer group. The medical complexity weighting model increases the share of HCCC in those peer groups with higher proportions of medical HCCC separations (A2, A3 and BMN).

Table 11 Result of optional approaches for measurement of share of HCCC by hospital peer group

2009 Peer Group	Raw HCCC	Cost weighted HCCC	Medical complexity weighted HCCC
A1 Principal referral	81.80%	85.31%	81.87%
A2 Paediatric specialist	4.39%	3.21%	4.79%
A3 Ungrouped acute	4.44%	3.37%	4.48%
BM Major metropolitan	3.52%	3.10%	3.26%
BNM Major non-metropolitan	5.84%	5.01%	5.60%
Total	**100.0%**	**100.0%**	**100.0%**

None of the HCCC models above is a very good proxy for indirect research and learning costs because, as shown in Figure 3 (page 27) the relationship between HCCC share and share of direct teaching, research and learning positions differs by Area.

Accordingly, Table 12 shows the results of two options for measuring the share of indirect teaching, research and learning costs. Both are composite measures that incorporate both raw and case weighted HCCC as well as share of direct teaching and research related positions.

Blended Index 1 = Average of (1) direct teaching and research share in last two years (2) share of raw HCCC and (3) share of case weighted HCCC.

Blended Index 2 = Average of (1) direct teaching and research share in last two years (2) share of raw HCCC weighted for medical complexity and (3) share of case weighted HCCC weighted for medical complexity.

Table 12 Results using two blended indexes for measurement of share of indirect teaching, research and learning in the RDF

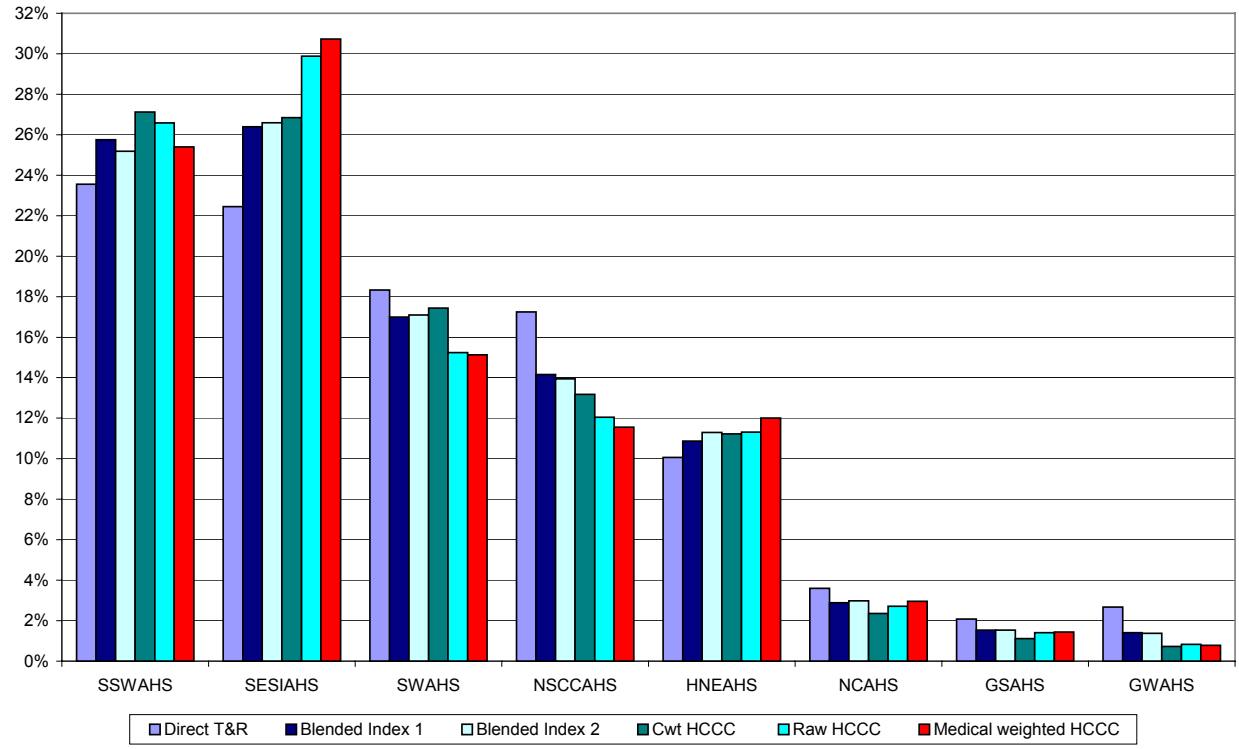
Area		Blended Index 1	Blended Index 2
X500	SSWAHS	25.75%	25.18%
X510	SESIAHS	26.39%	26.59%
X520	SWAHS	17.00%	17.10%
X530	NSCCAHS	14.16%	13.94%
X540	HNEAHS	10.87%	11.30%
X550	NCAHS	2.89%	2.98%
X560	GSAHS	1.54%	1.53%
X570	GWAHS	1.41%	1.38%
All		**100.00%**	**100.00%**

Figure 5 shows the results of the various options for measuring the indirect component and includes the results for the direct component as a comparator.

In the absence of evidence that medical patients are more likely to receive 'joint product' care and more likely to incur costs that the DRG cannot explain, the recommended approach to measuring indirect teaching, research and learning in the RDF is Blended Index 1. However, either blended model would be suitable for inclusion in the next iteration of the RDF.

Equivalent results by hospital peer group cannot be provided because the direct teaching and research share in the two options cannot be calculated except at the Area Health Service level.

Figure 5 Results of the various approaches to measuring indirect HCCC by Area Health Service



7 Discussion and recommendations

7.1 Intensive care

Recommendation 1. **That the full cost of care for Intensive Care (IC) patients (not High Dependency patients) in designated ICUs (as per the Episode Funding Guidelines) continue to be built into the RDF.**

This not only acts as a proxy for clinical complexity that cannot adequately be explained by the DRG classification, it also recognises and reinforces that ICUs are resources for the whole of the health system and not simply the Area in which they are located.

Recommendation 2. **That the cost of IC be moved out of the Teaching and Research component of the RDF and into the Acute Care component of the RDF.**

Under this approach, care for IC patients would be treated as a statewide service within the Acute Care component.

Table 13 shows the split of Intensive Care (IC) by Area Health Service and Table 14 by peer group based on these recommendations.

Table 13 Intensive care patient share by Area Health Service

Area Code	AHS	% share
X500	SSWAHS	23.44%
X510	SESIAHS	25.94%
X520	SWAHS	16.87%
X530	NSCCAHS	14.99%
X540	HNEAHS	9.12%
X550	NCAHS	5.06%
X560	GSAHS	2.62%
X570	GWAHS	1.96%
Total		**100.00%**

Note: 2007 and 2008 calendar year activity data and 2009/10 costs

Table 14 Percentage share of Intensive Care funding by peer group (2009/10 Episode Funding Model)

2009 Peer Group	% share
A1	71.7%
A2	4.1%
A3	1.7%
BM	10.8%
BNM	11.6%
Grand Total	100.0%

7.2 Direct Teaching, Research and Learning

Recommendation 3. **That the Direct Teaching and Research component be based on the cost of designated teaching, learning and research related positions with proportional weightings based on judgments about the average percentage of staff time that is devoted to teaching, learning and research.**

This staffing information is based on staff profiles as extracted from payroll data (HIE State staff award tables) rather than based on reports by Areas.

Recommendation 4. **That the weighting for Clinical Academics be reduced from 1.0 to 0.8.**

These positions had a weighting of 1.0 in the last version of the RDF. It is recommended that this be reduced to 0.8 to recognise that these positions do provide patient care.

Table 15 Recommended weightings for teaching, research and learning related staff categories

Category	Recommended weighting
Assistant in Nursing (student nurse)	0.7
Clinical Academic	0.8
Clinical Nurse Consultant Educator	1.0
Interns	0.7
Nurse Educator	1.0
Librarian	1.0
Registrars	0.5
Residents	0.5
Scientific & technical clinical support	Trainees 1.0, all others 0.8
Other trainee	1.0
Trainee Enrolled Nurse	0.5

Recommendation 5. **That the time period used to calculate each Area's share of teaching, research and learning positions be the last two years.**

As described in Section 6.2, the share of staff in teaching and research positions in rural areas has increased progressively over each of the last 5 years meaning that the time period used to calculate each Area's share of teaching and research related positions impacts on the results for some Areas. The usual metric of 5 years is too long in this context.

Recommendation 6. **That HCCC activity no longer be included in the calculation of the direct Teaching and Research component of the RDF.**

As discussed in Section 5.2, staff data can now be extracted from payroll data (HIE State staff award tables) rather than based on reports by Areas. Further, the direct teaching and research component of the RDF covers all programs (including community and primary care and mental health) and not just acute care.

Table 16 shows the results for the direct component by Area Health Service based on these recommendations.

Table 16 Share of direct teaching, research and learning component of the RDF

Area		% share
X500	SSWAHS	23.56%
X510	SESIAHS	22.45%
X520	SWAHS	18.33%
X530	NSCCAHS	17.25%
X540	HNEAHS	10.06%
X550	NCAHS	3.59%
X560	GSAHS	2.08%
X570	GWAHS	2.68%
All		100.00%

7.3 Indirect Teaching, Research and Learning

Recommendation 7. **That a new Blended Index be introduced to calculate Indirect Teaching, Research and Learning shares based on three elements (1) Direct Teaching, Research and Learning positions (2) raw Medical and Surgical HCCC and (3) case weighted Medical and Surgical HCCC**

The recommended index is the mean of these three elements. In combination, these three elements are designed as a proxy measure of:

- The indirect cost of teaching, research and learning.
- Within-DRG clinical complexity differences.
- The cost of 'joint product' or 'mixed product' services in which patient care, research, teaching and learning are delivered together and cannot be separated.
- Stand-by capacity (the more complex the casemix, the greater the need to provide 'on-call' services in a wider range of sub-specialities).

Recommendation 8. **That all hospitals in the A and B peer groups in all Area Health Services be in-scope for this element of the RDF**

Table 17 shows results by Area Health Service based on these recommendations.

Table 17 Share of indirect teaching, research and learning component of the RDF by Area Health Service

Area		% share
X500	SSWAHS	25.75%
X510	SESIAHS	26.39%
X520	SWAHS	17.00%
X530	NSCCAHS	14.16%
X540	HNEAHS	10.87%
X550	NCAHS	2.89%
X560	GSAHS	1.54%
X570	GWAHS	1.41%
All		**100.00%**

As noted earlier, results that incorporate a measure of designated teaching, research and learning positions cannot be reported by peer group. Accordingly, Table 18 shows only the results for the HCCC components of the recommended indirect teaching, research and learning blended index.

Table 18 Share of HCCC in the indirect teaching, research and learning component of the RDF by hospital peer group

Area	% share raw Medical and Surgical HCCC	% share case weighted Medical and Surgical HCCC	% share Medical and Surgical HCCC total
A1 Principal referral	81.80%	85.31%	83.56%
A2 Paediatric specialist	4.39%	3.21%	3.80%
A3 Ungrouped acute	4.44%	3.37%	3.91%
BM Major metropolitan	3.52%	3.10%	3.31%
BNM Major non metropolitan	5.84%	5.01%	5.43%
All	**100.00%**	**100.00%**	**100.00%**

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Appendix 1

HCCC profile data

This appendix contains summary HCCC profile data over the last five years. It includes the 'other' category. Accordingly, the data in these tables vary slightly from those used in the recommended models.

Table 19 HCCC activity by peer group 2004

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	28854	77.3%	116396.92	83.3%
A2	Paediatric specialist	1728	4.6%	4836.75	3.5%
A3	Ungrouped acute	2930	7.8%	5356.05	3.8%
BM	Major metropolitan	1218	3.3%	4450.44	3.2%
BNM	Major non metropolitan	1966	5.3%	6599.21	4.7%
C1	District group 1	468	1.3%	1511.25	1.1%
C2	District group 2	184	0.5%	504.04	0.4%
Total		**37348**	**100.0%**	**139654.66**	**100.0%**

Table 20 HCCC activity by peer group 2005

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	29778	78.3%	122073.80	83.4%
A2	Paediatric specialist	1641	4.3%	4602.71	3.1%
A3	Ungrouped acute	2522	6.6%	5644.13	3.9%
BM	Major metropolitan	1181	3.1%	4430.45	3.0%
BNM	Major non metropolitan	2240	5.9%	7674.88	5.2%
C1	District group 1	439	1.2%	1355.95	0.9%
C2	District group 2	229	0.6%	649.75	0.4%
Total		**38030**	**100.0%**	**146431.66**	**100.0%**

Table 21 HCCC activity by peer group 2006

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	30640	78.5%	124681.78	83.6%
A2	Paediatric specialist	1499	3.8%	4741.58	3.2%
A3	Ungrouped acute	2819	7.2%	6295.41	4.2%
BM	Major metropolitan	1219	3.1%	4307.34	2.9%
BNM	Major non metropolitan	2218	5.7%	7400.30	5.0%
C1	District group 1	399	1.0%	1129.54	0.8%
C2	District group 2	242	0.6%	541.85	0.4%
Total		**39036**	**100.0%**	**149097.81**	**100.0%**

Table 22 HCCC activity by peer group 2007

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	31473	78.0%	127994.91	83.8%
A2	Paediatric specialist	1785	4.4%	4847.05	3.2%
A3	Ungrouped acute	2828	7.0%	6188.92	4.1%
BM	Major metropolitan	1368	3.4%	4705.53	3.1%
BNM	Major non metropolitan	2178	5.4%	7366.74	4.8%
C1	District group 1	444	1.1%	1264.51	0.8%
C2	District group 2	278	0.7%	444.77	0.3%
Total		**40354**	**100.0%**	**152812.43**	**100.0%**

Table 23 HCCC activity by peer group 2008

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	31708	77.9%	129951.92	83.8%
A2	Paediatric specialist	1727	4.2%	5065.77	3.3%
A3	Ungrouped acute	2931	7.2%	6266.30	4.0%
BM	Major metropolitan	1325	3.3%	4509.53	2.9%
BNM	Major non metropolitan	2300	5.6%	7378.74	4.8%
C1	District group 1	400	1.0%	1191.64	0.8%
C2	District group 2	332	0.8%	654.92	0.4%
Total		**40723**	**100.0%**	**155018.82**	**100.0%**

Table 24 HCCC activity by peer group average over last five years

Peer group code	Peer group	Total separations	Proportion of total separations	Total case weighted separations	Proportion of case weighted separations
A1	Principal referral	30490.6	78.0%	124219.87	83.6%
A2	Paediatric specialist	1676	4.3%	4818.77	3.2%
A3	Ungrouped acute	2806	7.2%	5950.16	4.0%
BM	Major metropolitan	1262.2	3.2%	4480.66	3.0%
BNM	Major nonmetropolitan	2180.4	5.6%	7283.98	4.9%
C1	District group 1	430	1.1%	1290.57	0.9%
C2	District group 2	253	0.6%	559.07	0.4%
Total		**39098.2**	**100.0%**	**148603.08**	**100.0%**

Table 25 DRG profile by type 2004

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	798767	5482	804249	14.7%	70.8%
Other	79534	1145	80679	3.1%	7.1%
Surgical	219677	30721	250398	82.3%	22.1%
Total	**1097978**	**37348**	**1135326**	**100.0%**	**100.0%**

Table 26 DRG profile by type 2005

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	820262	5545	825807	14.6%	70.9%
Other	80321	1045	81366	2.7%	7.0%
Surgical	225855	31440	257295	82.7%	22.1%
Total	**1126438**	**38030**	**1164468**	**100.0%**	**100.0%**

Table 27 DRG profile by type 2006

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	882289	5686	887975	14.6%	71.7%
Other	81947	770	82717	2.0%	6.7%
Surgical	235705	32580	268285	83.5%	21.7%
Total	**1199941**	**39036**	**1238977**	**100.0%**	**100.0%**

Table 28 DRG profile by type 2007

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	919290	5660	924950	14.0%	72.0%
Other	81807	725	82532	1.8%	6.4%
Surgical	243393	33969	277362	84.2%	21.6%
Total	**1244490**	**40354**	**1284844**	**100.0%**	**100.0%**

Table 29 DRG profile by type 2008

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	920325	5705	926030	14.0%	71.9%
Other	83757	771	84528	1.9%	6.6%
Surgical	243304	34247	277551	84.1%	21.5%
Total	**1247386**	**40723**	**1288109**	**100.0%**	**100.0%**

Table 30 DRG profile by type average over last 5 years

DRG Type	HCCC?		Total separations	% HCCC	% All Separations
	No	Yes			
Medical	868186.6	5615.6	873802.2	14.4%	71.5%
Other	81473.2	891.2	82364.4	2.3%	6.7%
Surgical	233586.8	32591.4	266178.2	83.4%	21.8%
Total	**1183246.6**	**39098.2**	**1222344.8**	**100.0%**	**100.0%**

Appendix 2

Results for the current 8 Area Health Services

In Table 31 to Table 36 , the total numbers of raw and case weighted separations are presented by Area Health Service (AHS) for each year 2004 – 2008 as well as for the average across these five years. The distribution across the Areas is also presented in each table.

Table 31 HCCC activity by Area Health Service 2004

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	37451.9	9250	26.8%	24.8%
510	South Eastern Sydney/Illawarra AHS	39118.2	13075	28.0%	35.0%
520	Sydney West Area Health Service	23964.7	5177	17.2%	13.9%
530	Northern Sydney/Central Coast AHS	18392.1	4310	13.2%	11.5%
540	Hunter/New England Area Health Service	14493.6	3647	10.4%	9.8%
550	North Coast Area Health Service	2962.1	870	2.1%	2.3%
560	Greater Southern Area Health Service	2134.8	692	1.5%	1.9%
570	Greater Western Area Health Service	1137.2	327	0.8%	0.9%
Total		139654.7	37348	100.0%	100.0%

Table 32 HCCC activity by Area Health Service 2005

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	38961.4	9554	26.6%	25.1%
510	South Eastern Sydney/Illawarra AHS	39595.4	12502	27.0%	32.9%
520	Sydney West Area Health Service	25663.3	5514	17.5%	14.5%
530	Northern Sydney/Central Coast AHS	19493.4	4380	13.3%	11.5%
540	Hunter/New England Area Health Service	15507.7	3951	10.6%	10.4%
550	North Coast Area Health Service	3835.0	1140	2.6%	3.0%
560	Greater Southern Area Health Service	2216.5	667	1.5%	1.8%
570	Greater Western Area Health Service	1159.0	322	0.8%	0.8%
Total		**146431.7**	**38030**	**100.0%**	**100.0%**

Table 33 HCCC activity by Area Health Service 2006

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	39751.4	9748	26.7%	25.0%
510	South Eastern Sydney/Illawarra AHS	41164.4	12558	27.6%	32.2%
520	Sydney West Area Health Service	25578.2	5884	17.2%	15.1%
530	Northern Sydney/Central Coast AHS	18461.8	4385	12.4%	11.2%
540	Hunter/New England Area Health Service	16987.3	4287	11.4%	11.0%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
550	North Coast Area Health Service	3923.8	1144	2.6%	2.9%
560	Greater Southern Area Health Service	2020.1	682	1.4%	1.7%
570	Greater Western Area Health Service	1210.8	348	0.8%	0.9%
Total		**149097.8**	**39036**	**100.0%**	**100.0%**

Table 34 HCCC activity by Area Health Service 2007

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	39683.7	9980	26.0%	24.7%
510	South Eastern Sydney/Illawarra AHS	41697.7	13065	27.3%	32.4%
520	Sydney West Area Health Service	26522.9	6147	17.4%	15.2%
530	Northern Sydney/Central Coast AHS	20050.3	4518	13.1%	11.2%
540	Hunter/New England Area Health Service	17836.4	4521	11.7%	11.2%
550	North Coast Area Health Service	3734.9	1094	2.4%	2.7%
560	Greater Southern Area Health Service	1983.0	642	1.3%	1.6%
570	Greater Western Area Health Service	1303.5	387	0.9%	1.0%
Total		**152812.4**	**40354**	**100.0%**	**100.0%**

Table 35 HCCC activity by Area Health Service 2008

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	41897.2	10140	27.0%	24.9%
510	South Eastern Sydney/Illawarra AHS	41163.3	12841	26.6%	31.5%
520	Sydney West Area Health Service	26569.2	6037	17.1%	14.8%
530	Northern Sydney/Central Coast AHS	19860.4	4467	12.8%	11.0%
540	Hunter/New England Area Health Service	18248.9	4969	11.8%	12.2%
550	North Coast Area Health Service	3708.5	1098	2.4%	2.7%
560	Greater Southern Area Health Service	2010.9	658	1.3%	1.6%
570	Greater Western Area Health Service	1560.3	513	1.0%	1.3%
Total		**155018.8**	**40723**	**100.0%**	**100.0%**

Table 36 HCCC activity by Area Health Service average over five years

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	39549.1	9734.4	26.6%	24.9%
510	South Eastern Sydney/Illawarra AHS	40547.8	12808.2	27.3%	32.8%
520	Sydney West Area Health Service	25659.7	5751.8	17.3%	14.7%
530	Northern Sydney/Central Coast AHS	19251.6	4412	13.0%	11.3%
540	Hunter/New England Area Health Service	16614.8	4275	11.2%	10.9%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
550	North Coast Area Health Service	3632.9	1069.2	2.4%	2.7%
560	Greater Southern Area Health Service	2073.1	668.2	1.4%	1.7%
570	Greater Western Area Health Service	1274.2	379.4	0.9%	1.0%
Total		**148603.1**	**39098.2**	**100.0%**	**100.0%**

The information presented in Table 37 to Table 42 is similar to that in the previous six tables, except that the only patients counted in the following six tables are those who are also residents of the Area in which their treatment is provided.

Table 37 HCCC activity for patients residing in the treatment AHS 2004

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	21828.0	5492	23.8%	23.0%
510	South Eastern Sydney/Illawarra AHS	21900.1	6521	23.9%	27.3%
520	Sydney West Area Health Service	16973.4	3933	18.5%	16.4%
530	Northern Sydney/Central Coast AHS	12759.8	3122	13.9%	13.1%
540	Hunter/New England Area Health Service	12722.9	3282	13.9%	13.7%
550	North Coast Area Health Service	2555.3	709	2.8%	3.0%
560	Greater Southern Area Health Service	1719.8	545	1.9%	2.3%
570	Greater Western Area Health Service	1092.5	313	1.2%	1.3%
Total		**91551.6**	**23917.0**	**100.0%**	**100.0%**

Table 38 HCCC activity for patients residing in the treatment AHS 2005

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	23571.28	5964	24.3%	24.0%
510	South Eastern Sydney/Illawarra AHS	22192.14	6346	22.8%	25.5%
520	Sydney West Area Health Service	17912.35	4163	18.4%	16.7%
530	Northern Sydney/Central Coast AHS	13516.65	3149	13.9%	12.7%
540	Hunter/New England Area Health Service	13776.69	3558	14.2%	14.3%
550	North Coast Area Health Service	3324.12	880	3.4%	3.5%
560	Greater Southern Area Health Service	1805.22	517	1.9%	2.1%
570	Greater Western Area Health Service	1073.68	298	1.1%	1.2%
Total		**97172.13**	**24875**	**100.0%**	**100.0%**

Table 39 HCCC activity for patients residing in the treatment AHS 2006

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	24349.5	6106	24.2%	23.3%
510	South Eastern Sydney/Illawarra AHS	23327.0	6586	23.2%	25.2%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
520	Sydney West Area Health Service	18480.2	4528	18.4%	17.3%
530	Northern Sydney/Central Coast AHS	13318.2	3262	13.2%	12.5%
540	Hunter/New England Area Health Service	15010.5	3889	14.9%	14.9%
550	North Coast Area Health Service	3419.9	921	3.4%	3.5%
560	Greater Southern Area Health Service	1643.6	535	1.6%	2.0%
570	Greater Western Area Health Service	1111.6	323	1.1%	1.2%
Total		**100660.6**	**26150.0**	**100.0%**	**100.0%**

Table 40 HCCC activity for patients residing in the treatment AHS 2007

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	23834.2	6272	23.1%	23.1%
510	South Eastern Sydney/Illawarra AHS	23886.9	6957	23.2%	25.6%
520	Sydney West Area Health Service	19250.7	4768	18.7%	17.5%
530	Northern Sydney/Central Coast AHS	14245.5	3319	13.8%	12.2%
540	Hunter/New England Area Health Service	15717.5	4054	15.3%	14.9%
550	North Coast Area Health Service	3189.0	914	3.1%	3.4%
560	Greater Southern Area Health Service	1676.1	537	1.6%	2.0%
570	Greater Western Area Health Service	1237.6	370	1.2%	1.4%
Total		**103037.5**	**27191**	**100.0%**	**100.0%**

Table 41 HCCC activity for patients residing in the treatment AHS 2008

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	26019.1	6510	24.7%	23.5%
510	South Eastern Sydney/Illawarra AHS	23470.5	6778	22.3%	24.5%
520	Sydney West Area Health Service	19402.4	4674	18.4%	16.9%
530	Northern Sydney/Central Coast AHS	14082.1	3278	13.4%	11.9%
540	Hunter/New England Area Health Service	15972.3	4445	15.2%	16.1%
550	North Coast Area Health Service	3276.4	959	3.1%	3.5%
560	Greater Southern Area Health Service	1650.3	521	1.6%	1.9%
570	Greater Western Area Health Service	1501.3	494	1.4%	1.8%
Total		**105374.4**	**27659.0**	**100.0%**	**100.0%**

Table 42 HCCC activity for patients residing in the treatment AHS average over 5 yrs

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
500	Sydney South West Area Health Service	23920.4	6068.8	24.0%	23.4%
510	South Eastern Sydney/Illawarra AHS	22955.3	6637.6	23.1%	25.6%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
520	Sydney West Area Health Service	18403.8	4413.2	18.5%	17.0%
530	Northern Sydney/Central Coast AHS	13584.4	3226.0	13.6%	12.4%
540	Hunter/New England Area Health Service	14640.0	3845.6	14.7%	14.8%
550	North Coast Area Health Service	3152.9	876.6	3.2%	3.4%
560	Greater Southern Area Health Service	1699.0	531.0	1.7%	2.0%
570	Greater Western Area Health Service	1203.3	359.6	1.2%	1.4%
Total		**99559.2**	**25958.4**	**100.0%**	**100.0%**

Appendix 3

Results for the previous 17 Area Health Services (adjusted for 2005 boundary changes)

ICU

The distribution of ICU activity across the former 17 Areas is presented in Table 43.

Table 43 ICU results at the 17 Area level

Previous Area Health Service	% of total
100 Central Sydney	11.7%
105 Northern Sydney	12.4%
120 Western Sydney	12.6%
125 Wentworth	4.2%
130 SW Sydney	11.7%
135 Central Coast	2.6%
140 Hunter	7.1%
145 Illawarra	3.3%
155 SE Sydney	22.7%
400 Northern Rivers	2.3%
410 Mid North Coast	2.8%
420 New England	2.0%
430 Macquarie	0.8%
440 Mid Western	1.2%
450 Far West	0.0%
460 Greater Murray	0.0%
470 Southern	2.6%
Total	**100.0%**

Note: 2007 and 2008 calendar year activity data and 2009/10 costs

Staff in teaching and research positions

The staff FTE analysis cannot be undertaken at this level because 548 (8.7%) positions across Area Health Services have a facility code other than a hospital. These include 240 registrar positions that are allocated to an Area level code rather than a facility. It also includes positions in areas such as group pathology services, Area-wide mental health and community health services and Area workforce development units.

Table 44 Percentage of teaching and research related FTE positions that cannot be mapped to the previous Area Health Services

Year	Area	2008/09
X500	SSWAHS	9.4%
X510	SESIAHS	3.5%
X520	SWAHS	9.0%
X530	NSCCAHS	12.0%
X540	HNEAHS	10.5%
X550	NCAHS	4.0%
X560	GSAHS	24.9%
X570	GWAHS	9.4%
All		**8.7%**

HCCC

In Table 45 to Table 50 the total numbers of raw and case weighted separations are presented by the former 17 Area Health Services (adjusted for 2005 boundary changes) for each year 2004 – 2008 as well as for the average across these five years. The distribution across the Areas is also presented in each table.

Table 45 HCCC activity previous 17 areas 2004

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	24665.4	6118	17.7%	16.4%
105	Northern Sydney	15312.1	3449	11.0%	9.2%
120	Western Sydney	19332.9	4177	13.8%	11.2%
125	Wentworth	4631.8	1000	3.3%	2.7%
130	SW Sydney	12786.5	3132	9.2%	8.4%
135	Central Coast	3079.9	861	2.2%	2.3%
140	Hunter	13782.8	3437	9.9%	9.2%
145	Illawarra	3478.2	941	2.5%	2.5%
155	SE Sydney	35640.0	12134	25.5%	32.5%
400	Northern Rivers	1727.5	525	1.2%	1.4%
410	Mid North Coast	1234.6	345	0.9%	0.9%
420	New England	710.9	210	0.5%	0.6%
430	Macquarie	308.1	84	0.2%	0.2%
440	Mid Western	781.1	220	0.6%	0.6%
450	Far West	48.0	23	0.0%	0.1%
460	Greater Murray	1835.2	614	1.3%	1.6%
470	Southern	299.7	78	0.2%	0.2%
Total		**139654.7**	**37348**	**100.0%**	**100.0%**

Table 46 HCCC activity previous 17 areas 2005

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	25511.6	6247	17.4%	16.4%
105	Northern Sydney	16485.9	3556	11.3%	9.4%
120	Western Sydney	20386.1	4316	13.9%	11.3%
125	Wentworth	5277.1	1198	3.6%	3.2%
130	SW Sydney	13449.8	3307	9.2%	8.7%
135	Central Coast	3007.4	824	2.1%	2.2%
140	Hunter	14486.0	3695	9.9%	9.7%
145	Illawarra	3812.7	1024	2.6%	2.7%
155	SE Sydney	35782.7	11478	24.4%	30.2%
400	Northern Rivers	2046.9	703	1.4%	1.8%
410	Mid North Coast	1788.1	437	1.2%	1.1%
420	New England	1021.7	256	0.7%	0.7%
430	Macquarie	330.0	82	0.2%	0.2%
440	Mid Western	794.1	223	0.5%	0.6%
450	Far West	34.9	17	0.0%	0.0%
460	Greater Murray	1806.8	585	1.2%	1.5%
470	Southern	409.7	82	0.3%	0.2%
Total		**146431.7**	**38030**	**100.0%**	**100.0%**

Table 47 HCCC activity previous 17 areas 2006

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	25697.1	6288	17.2%	16.1%
105	Northern Sydney	15614.5	3500	10.5%	9.0%
120	Western Sydney	19419.9	4313	13.0%	11.0%
125	Wentworth	6158.3	1571	4.1%	4.0%
130	SW Sydney	14054.3	3460	9.4%	8.9%
135	Central Coast	2847.3	885	1.9%	2.3%
140	Hunter	16296.6	4090	10.9%	10.5%
145	Illawarra	3878.3	1122	2.6%	2.9%
155	SE Sydney	37286.1	11436	25.0%	29.3%
400	Northern Rivers	2514.9	763	1.7%	2.0%
410	Mid North Coast	1408.9	381	0.9%	1.0%
420	New England	690.7	197	0.5%	0.5%
430	Macquarie	447.9	109	0.3%	0.3%
440	Mid Western	709.5	221	0.5%	0.6%
450	Far West	53.4	18	0.0%	0.0%
460	Greater Murray	1746.7	605	1.2%	1.5%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
470	Southern	273.4	77	0.2%	0.2%
Total		**149097.8**	**39036**	**100.0%**	**100.0%**

Table 48 HCCC activity previous 17 areas 2007

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	26236.8	6388	17.2%	15.8%
105	Northern Sydney	16894.9	3621	11.1%	9.0%
120	Western Sydney	20489.8	4633	13.4%	11.5%
125	Wentworth	6033.0	1514	3.9%	3.8%
130	SW Sydney	13446.9	3592	8.8%	8.9%
135	Central Coast	3155.4	897	2.1%	2.2%
140	Hunter	17188.9	4334	11.2%	10.7%
145	Illawarra	4540.0	1308	3.0%	3.2%
155	SE Sydney	37157.7	11757	24.3%	29.1%
400	Northern Rivers	2199.4	670	1.4%	1.7%
410	Mid North Coast	1535.5	424	1.0%	1.1%
420	New England	647.5	187	0.4%	0.5%
430	Macquarie	431.1	115	0.3%	0.3%
440	Mid Western	810.8	249	0.5%	0.6%
450	Far West	61.6	23	0.0%	0.1%
460	Greater Murray	1758.4	575	1.2%	1.4%
470	Southern	224.6	67	0.1%	0.2%
Total		**152812.4**	**40354**	**100.0%**	**100.0%**

Table 49 HCCC activity previous 17 areas 2008

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	27052.8	6513	17.5%	16.0%
105	Northern Sydney	17136.6	3660	11.1%	9.0%
120	Western Sydney	20282.7	4662	13.1%	11.4%
125	Wentworth	6286.5	1375	4.1%	3.4%
130	SW Sydney	14844.4	3627	9.6%	8.9%
135	Central Coast	2723.8	807	1.8%	2.0%
140	Hunter	17584.8	4764	11.3%	11.7%
145	Illawarra	4499.4	1309	2.9%	3.2%
155	SE Sydney	36663.9	11532	23.7%	28.3%
400	Northern Rivers	2017.3	580	1.3%	1.4%
410	Mid North Coast	1691.2	518	1.1%	1.3%

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
420	New England	664.1	205	0.4%	0.5%
430	Macquarie	380.7	108	0.2%	0.3%
440	Mid Western	1123.6	377	0.7%	0.9%
450	Far West	56.0	28	0.0%	0.1%
460	Greater Murray	1625.7	555	1.0%	1.4%
470	Southern	385.2	103	0.2%	0.3%
Total		**155018.8**	**40723**	**100.0%**	**100.0%**

Table 50 HCCC activity previous 17 areas average over last five years

AHS Code	AHS Name	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
100	Central Sydney	25832.7	6310.8	17.4%	16.1%
105	Northern Sydney	16288.8	3557.2	11.0%	9.1%
120	Western Sydney	19982.3	4420.2	13.4%	11.3%
125	Wentworth	5677.4	1331.6	3.8%	3.4%
130	SW Sydney	13716.4	3423.6	9.2%	8.8%
135	Central Coast	2962.8	854.8	2.0%	2.2%
140	Hunter	15867.8	4064	10.7%	10.4%
145	Illawarra	4041.7	1140.8	2.7%	2.9%
155	SE Sydney	36506.1	11667.4	24.6%	29.8%
400	Northern Rivers	2101.2	648.2	1.4%	1.7%
410	Mid North Coast	1531.7	421	1.0%	1.1%
420	New England	747.0	211	0.5%	0.5%
430	Macquarie	379.6	99.6	0.3%	0.3%
440	Mid Western	843.8	258	0.6%	0.7%
450	Far West	50.8	21.8	0.0%	0.1%
460	Greater Murray	1754.6	586.8	1.2%	1.5%
470	Southern	318.5	81.4	0.2%	0.2%
Total		**148603.1**	**39098.2**	**100.0%**	**100.0%**

Appendix 4

Results for the RDF Area Health Service Population Cluster Level

Intensive Care

The distribution of ICU activity across the 24 Clusters is presented in Table 51.

Table 51 ICU results at the population cluster level

AHS	Cluster	% share
500 Sydney South West Area Health Service	Inner West	11.74%
	Canterbury Bankstown	1.12%
	Liverpool Fairfield	8.80%
	Macarthur Health Service	1.79%
510 South Eastern Sydney/Illawarra Area Health Service	Former Illawarra	3.26%
	Eastern	14.89%
	Former Southern Sydney	7.80%
530 Northern Sydney/Central Coast Area Health Service	Hornsby-Kuringai	1.31%
	Lower Northern Sydney	9.35%
	Northern Beaches	1.72%
	Central Coast	2.61%
520 Sydney West Area Health Service	Eastern & Blacktown	12.64%
	Western & Hawkesbury	4.23%
550 North Coast Area Health Service	Richmond Tweed & Byron	2.27%
	Coffs, Clarence, Hastings & Macleay	2.79%
540 Hunter/New England Area Health Service	Greater Newcastle	7.12%
	Former New England (excluding Quirindi)	2.00%
570 Greater Western Area Health Service	Former Macquarie & Far West	0.79%
	Former Mid Western	1.17%
560 Greater Southern Area Health Service	Greater Albury, Wagga Wagga, Golden, Southern Slopes	2.62%
Total		**100.0%**

Note: 2007 and 2008 calendar year activity data and 2009/10 costs

Staff in teaching and research positions

As discussed in the previous attachment, the staff FTE analysis cannot be undertaken at this level.

HCCC

In Table 52 to Table 57 the total numbers of raw and case weighted separations are presented by the 24 Clusters for each year 2004 – 2008 as well as for the average across these five years. The distribution across the Areas is also presented in each table.

Table 52 HCCC profile at the cluster level 2004

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1452.9	376	1.0%	1.0%
Central Coast	3079.9	861	2.2%	2.3%
Coffs, Clarence, Hastings & Macleay	1387.9	381	1.0%	1.0%
Eastern	27198.4	10147	19.5%	27.2%
Eastern & Blacktown	19332.9	4177	13.8%	11.2%
Eurobodalla, Bega Valley	122.5	37	0.1%	0.1%
Former Illawarra	3478.2	941	2.5%	2.5%
Former Macquarie & Far West	356.1	107	0.3%	0.3%
Former Mid Western	781.1	220	0.6%	0.6%
Former New England (excluding Quirindi)	710.9	210	0.5%	0.6%
Former Southern Sydney	8441.6	1987	6.0%	5.3%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1720.5	579	1.2%	1.6%
Greater Newcastle	13247.8	3287	9.5%	8.8%
Hornsby-Kuringai	357.1	94	0.3%	0.3%
Inner West	24369.1	6031	17.4%	16.1%
Liverpool Fairfield	11264.1	2716	8.1%	7.3%
Lower Northern Sydney	14544.7	3246	10.4%	8.7%
Lower Western, Murrumbidgee	151.6	40	0.1%	0.1%
Macarthur Health Service	365.8	127	0.3%	0.3%
Northern Beaches	410.3	109	0.3%	0.3%
Richmond Tweed & Byron	1574.2	489	1.1%	1.3%
Rural Hunter & Lower Mid North	534.9	150	0.4%	0.4%
Southern Tablelands, Monaro	140.2	36	0.1%	0.1%
Western & Hawkesbury	4631.8	1000	3.3%	2.7%
Total	**139654.7**	**37348**	**100.0%**	**100.0%**

Table 53 HCCC profile at the cluster level 2005

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1443.5	377	377	1.0%
Central Coast	3007.4	824	824	2.2%
Coffs, Clarence, Hastings & Macleay	1878.8	460	460	1.2%
Eastern	27745.2	9543	9543	25.1%
Eastern & Blacktown	20386.1	4316	4316	11.3%
Eurobodalla, Bega Valley	202.9	34	34	0.1%
Former Illawarra	3812.7	1024	1024	2.7%
Former Macquarie & Far West	364.9	99	99	0.3%

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Former Mid Western	794.1	223	223	0.6%
Former New England (excluding Quirindi)	1021.7	256	256	0.7%
Former Southern Sydney	8037.5	1935	1935	5.1%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1723.6	561	561	1.5%
Greater Newcastle	13961.3	3537	3537	9.3%
Hornsby-Kuringai	485.6	115	115	0.3%
Inner West	25197.8	6155	6155	16.2%
Liverpool Fairfield	11933.1	2884	2884	7.6%
Lower Northern Sydney	15487.2	3311	3311	8.7%
Lower Western, Murrumbidgee	124.0	35	35	0.1%
Macarthur Health Service	387.0	138	138	0.4%
Northern Beaches	513.1	130	130	0.3%
Richmond Tweed & Byron	1956.3	680	680	1.8%
Rural Hunter & Lower Mid North	524.7	158	158	0.4%
Southern Tablelands, Monaro	166.1	37	37	0.1%
Western & Hawkesbury	5277.1	1198	1198	3.2%
Total	**146431.7**	**38030**	**100.0%**	**100.0%**

Table 54 HCCC profile at the cluster level 2006

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1510.2	403	403	1.0%
Central Coast	2847.3	885	885	2.3%
Coffs, Clarence, Hastings & Macleay	1505.6	407	407	1.0%
Eastern	28693.4	9388	9388	24.0%
Eastern & Blacktown	19419.9	4313	4313	11.0%
Eurobodalla, Bega Valley	158.9	37	37	0.1%
Former Illawarra	3878.3	1122	1122	2.9%
Former Macquarie & Far West	501.3	127	127	0.3%
Former Mid Western	709.5	221	221	0.6%
Former New England (excluding Quirindi)	690.7	197	197	0.5%
Former Southern Sydney	8592.6	2048	2048	5.2%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1615.3	569	569	1.5%
Greater Newcastle	15810.2	3915	3915	10.0%
Hornsby-Kuringai	380.1	96	96	0.2%
Inner West	25322.2	6180	6180	15.8%
Liverpool Fairfield	12594.0	3034	3034	7.8%
Lower Northern Sydney	14720.5	3270	3270	8.4%

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Lower Western, Murrumbidgee	143.6	41	41	0.1%
Macarthur Health Service	325.1	131	131	0.3%
Northern Beaches	513.9	134	134	0.3%
Richmond Tweed & Byron	2418.2	737	737	1.9%
Rural Hunter & Lower Mid North	486.4	175	175	0.4%
Southern Tablelands, Monaro	102.4	35	35	0.1%
Western & Hawkesbury	6158.3	1571	1571	4.0%
Total	**149097.8**	**39036**	**100.0%**	**100.0%**

Table 55 HCCC profile at the cluster level 2007

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1500.0	407	1.0%	1.0%
Central Coast	3155.4	897	2.1%	2.2%
Coffs, Clarence, Hastings & Macleay	1648.9	460	1.1%	1.1%
Eastern	28144.9	9519	18.4%	23.6%
Eastern & Blacktown	20489.8	4633	13.4%	11.5%
Eurobodalla, Bega Valley	85.2	19	0.1%	0.0%
Former Illawarra	4540.0	1308	3.0%	3.2%
Former Macquarie & Far West	492.7	138	0.3%	0.3%
Former Mid Western	810.8	249	0.5%	0.6%
Former New England (excluding Quirindi)	647.5	187	0.4%	0.5%
Former Southern Sydney	9012.9	2238	5.9%	5.5%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1673.4	544	1.1%	1.3%
Greater Newcastle	16677.1	4092	10.9%	10.1%
Hornsby-Kuringai	352.9	93	0.2%	0.2%
Inner West	25869.9	6286	16.9%	15.6%
Liverpool Fairfield	11935.2	3129	7.8%	7.8%
Lower Northern Sydney	16151.0	3420	10.6%	8.5%
Lower Western, Murrumbidgee	95.9	39	0.1%	0.1%
Macarthur Health Service	378.6	158	0.2%	0.4%
Northern Beaches	391.0	108	0.3%	0.3%
Richmond Tweed & Byron	2086.1	634	1.4%	1.6%
Rural Hunter & Lower Mid North	511.8	242	0.3%	0.6%
Southern Tablelands, Monaro	128.5	40	0.1%	0.1%
Western & Hawkesbury	6033.0	1514	3.9%	3.8%
Total	**152812.4**	**40354**	**100.0%**	**100.0%**

Table 56 HCCC profile at the cluster level 2008

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1363.8	344	0.9%	0.8%
Central Coast	2723.8	807	1.8%	2.0%
Coffs, Clarence, Hastings & Macleay	1779.6	542	1.1%	1.3%
Eastern	28119.3	9339	18.1%	22.9%
Eastern & Blacktown	20282.7	4662	13.1%	11.4%
Eurobodalla, Bega Valley	246.2	60	0.2%	0.1%
Former Illawarra	4499.4	1309	2.9%	3.2%
Former Macquarie & Far West	436.7	136	0.3%	0.3%
Former Mid Western	1123.6	377	0.7%	0.9%
Former New England (excluding Quirindi)	664.1	205	0.4%	0.5%
Former Southern Sydney	8544.6	2193	5.5%	5.4%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1478.2	523	1.0%	1.3%
Greater Newcastle	17068.1	4517	11.0%	11.1%
Hornsby-Kuringai	393.6	109	0.3%	0.3%
Inner West	26760.1	6424	17.3%	15.8%
Liverpool Fairfield	13286.0	3179	8.6%	7.8%
Lower Northern Sydney	16354.1	3442	10.5%	8.5%
Lower Western, Murrumbidgee	148.0	33	0.1%	0.1%
Macarthur Health Service	487.3	193	0.3%	0.5%
Northern Beaches	389.0	109	0.3%	0.3%
Richmond Tweed & Byron	1928.9	556	1.2%	1.4%
Rural Hunter & Lower Mid North	516.7	247	0.3%	0.6%
Southern Tablelands, Monaro	138.5	42	0.1%	0.1%
Western & Hawkesbury	6286.5	1375	4.1%	3.4%
Total	**155018.8**	**40723**	**100.0%**	**100.0%**

Table 57 HCCC profile at the cluster level average over last 5 years

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Canterbury Bankstown	1454.1	381.4	1.0%	1.0%
Central Coast	2962.8	854.8	2.0%	2.2%
Coffs, Clarence, Hastings & Macleay	1640.1	450	1.1%	1.2%
Eastern	27980.3	9587.2	18.8%	24.5%
Eastern & Blacktown	19982.3	4420.2	13.4%	11.3%
Eurobodalla, Bega Valley	163.1	37.4	0.1%	0.1%
Former Illawarra	4041.7	1140.8	2.7%	2.9%
Former Macquarie & Far West	430.3	121.4	0.3%	0.3%

Cluster	Total case weighted separations	Total separations	Proportion of case weighted separations	Proportion of total separations
Former Mid Western	843.8	258	0.6%	0.7%
Former New England (excluding Quirindi)	747.0	211	0.5%	0.5%
Former Southern Sydney	8525.8	2080.2	5.7%	5.3%
Greater Albury, Wagga Wagga, Golden, Southern Slopes	1642.2	555.2	1.1%	1.4%
Greater Newcastle	15352.9	3869.6	10.3%	9.9%
Hornsby-Kuringai	393.9	101.4	0.3%	0.3%
Inner West	25503.8	6215.2	17.2%	15.9%
Liverpool Fairfield	12202.5	2988.4	8.2%	7.6%
Lower Northern Sydney	15451.5	3337.8	10.4%	8.5%
Lower Western, Murrumbidgee	132.6	37.6	0.1%	0.1%
Macarthur Health Service	388.8	149.4	0.3%	0.4%
Northern Beaches	443.5	118	0.3%	0.3%
Richmond Tweed & Byron	1992.7	619.2	1.3%	1.6%
Rural Hunter & Lower Mid North	514.9	194.4	0.3%	0.5%
Southern Tablelands, Monaro	135.1	38	0.1%	0.1%
Western & Hawkesbury	5677.4	1331.6	3.8%	3.4%
Total	**148603.1**	**39098.2**	**100.0%**	**100.0%**