

# Issues and challenges facing rural hospitals

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## Abstract

*Australia's rural hospitals face most of the same issues and challenges faced by metropolitan hospitals. However they also face additional challenges around geographic isolation, their iconic status and role as major employers in local communities, and their close relationship with community based health services. Future opportunities include more formal integration with community service through multipurpose service arrangements, regional networking with urban centers, expanded use of IT linkages, and with the expanding rural academic networks. Rural hospitals' roles as key aged care providers in the country is a particular challenge.*

The health system is under intense pressure from a rapidly changing society. Technology costs are rising inexorably, patients' and providers' expectations are rising all the time, and changes to practice – such as the increase in short hospital stays, greater use of private health insurance and increasing care needs of an ageing population – all mean that hospitals are changing.

Rural hospitals are under similar, and many would contend additional, pressures. The current and future issues and challenges faced by hospitals located outside Australia's capital cities and major metropolitan centres are inextricably linked to geography, demography, political, social and economic forces.

## Some definition of terms

The terms “rural”, “regional” and “remote” are often used differently by different commentators, depending on context and meaning. At times these terms are used interchangeably (“rural” or “regional”), or may be used together (“rural-regional”). In this paper rural is used to mean “all of Australia outside the capital cities and major metropolitan areas”, corresponding to RRMA zones 3-7 (DPIE and DSHS 1991). Here, rural includes “remote”, those areas that are particularly distant from major centres, and that may have special issues and challenges, including the need to cater to the needs of Indigenous peoples.

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**Box: The 1994 Rural, Remote and Metropolitan Areas (RRMA) classification divides the nation as follows:**

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### State or territory

#### *Metropolitan Areas*

Capital City

Other Metropolitan Centre (population of 100,000 or more)

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### Non-metropolitan Zones

#### *Rural Zone*

Large Rural Centre (population 25,000-99,999)

Small Rural Centre (population 10,000-24,999)

Other Rural Area (population less than 10,000)

#### *Remote Zone*

Remote Centre (population of 5,000 or more)

Other Remote Area (population less than 5,000)

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However, although widely used, the RRMA classification is simplistic, focusing as it does on population size. It makes more sense to consider that each settlement (of whatever size) has two fundamental attributes. The first is whether it is urban or rural (referring to population size and obvious social, economic and geographic characteristics), and the second is whether it is accessible to or remote from a defined suite of services. This second attribute has been developed into a new classification system, known as ARIA (Accessibility/Remoteness Index of Australia). A particular asset of ARIA is that it can be used to index different services (National Centre for Social Applications in GIS). Thus, whereas every place in Australia has only one RRMA score, each place may well have a different ARIA score depending on what service is being measured. For example, Alice Springs, while obviously “remote” in common language use (“a long way from where most other people are”), is clearly a large town and hence is “urban”. Furthermore, while general practice services are highly accessible in Alice Springs, it is very remote from super-specialist services. These attributes are simply not reflected in a RRMA score, but can be in an ARIA score.

These issues are important when considering “rural hospitals” not simply because accurate definitions are important, but because they force us to consider critically what it is we mean about rurality, remoteness, and provision of services. Importantly, a more inclusive classification makes clear the wide variation in attributes, characteristics and needs of different rural communities, hospitals and health services, across Australia.

## **Geography and demography**

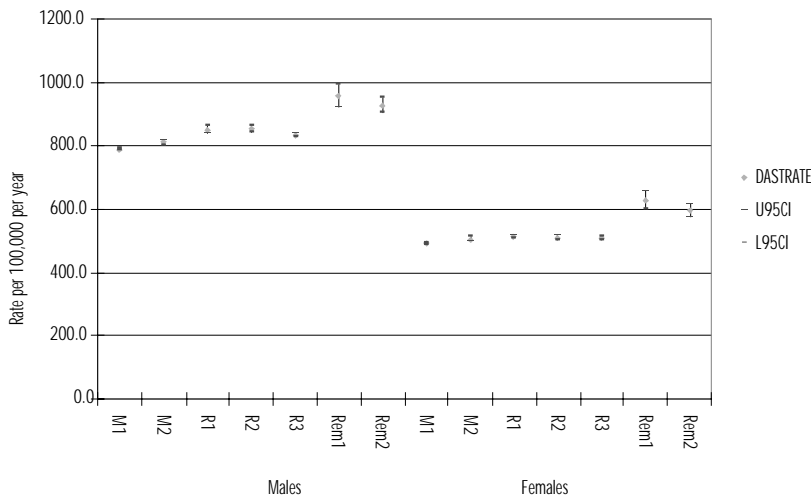
Australia is a highly urbanised country, however around 37% of the population (6.7 million people) live outside the capital cities and the major metropolitan centres. Indeed about 2.8 million people live in settlements of size less than 1000 population. The provision of health care, including hospital services, to these highly dispersed people is clearly a major challenge.

Importantly, “rural areas” are no more homogenous – in make up and need - than are “urban areas”. There is substantial regional variation in population growth (eg parts of regional Victoria and New South Wales) or decline (eg parts of regional South Australia and New South Wales), and hence substantial variation in economic prosperity. Thus, in some parts of rural Australia the challenge is how to provide more services to a growing and increasingly prosperous community, while in many more the challenge is how to provide traditional hospital-based services to a gradually shrinking community, whose prosperity is gradually falling, but whose health needs may well be rising, and whose expectations are also increasing (Hugo 2002).

## **Health status of rural and remote Australia**

It is widely reported that the health status of rural and remote Australians is poorer than that of urban Australians (AIHW 1998). Stratified by RRMA there is a modest mortality gradient from urban to remote (figure), for males and females (Phillips 2002).

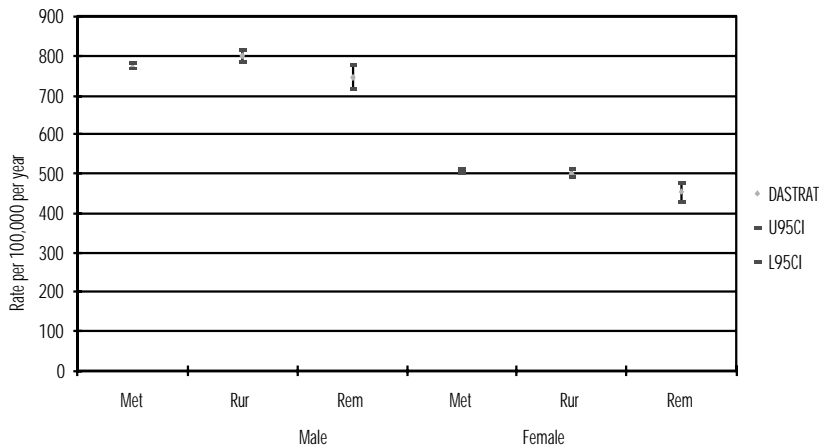
**Figure 1. Direct age standardised death rates for males and females, by RRMA category, 1994-1998, with 95% confidence intervals**



Notes: Age standardised to the Australian population at 30 June 1991. The plot includes a point estimate for the death rate, as well as 95% confidence intervals.  
Source: AIHW National Mortality database

However, this gradient is largely due to the 2-3 fold higher mortality rates experienced by Indigenous Australians. Examining non-Indigenous deaths in South Australia, Western Australia and the Northern Territory (where accurate data on Indigenous mortality are available), rural and remote mortality is either similar to or lower than urban mortality. It is clear then that much of the disparity between rural and urban health status is due to the very poor health status of Indigenous people. Non-metropolitan hospitals have a critical role to play in helping to address this gross inequity.

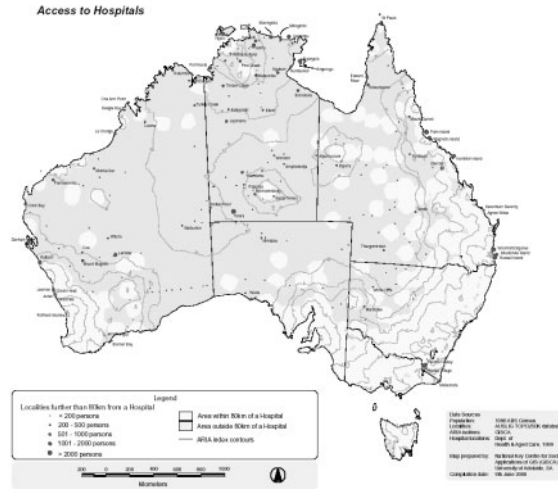
**Figure 2. Non-Indigenous death rates in SA, WA and NT, by RRMA zone, 1994-1998**



Note: Rates are direct age sex standardised death rates, standardised to the 1991 Australian population. Upper and lower 95% confidence intervals are included.  
Source: AIHW National Mortality database.

## Where are Australia's rural hospitals?

Figure 3. Access to hospitals



Source: [www.gjsca.adelaide.edu.au](http://www.gjsca.adelaide.edu.au)

This map is derived from locational data for the 671 hospitals located beyond the urban centre boundaries of capital cities and urban centres with more than 100,000 resident population in Australia. A community is classified as having a hospital only if the hospital has at least one overnight bed. In all, 1.2 per cent of the Australian population lives more than 80km away from a hospital. In the Northern Territory, the proportion is 23.0 per cent compared to 2.3 per cent in Western Australia and 1.6 per cent in Queensland. The greatest number of localities with more than 200 people further than 80 kilometres from a hospital occurs in the Northern territory (37), Western Australia (24) and Queensland (23). In the Northern Territory, 60.8 per cent of the indigenous population are located more than 80 kilometres from a hospital. In Western Australia the proportion was 19.3 per cent and 12.5 per cent in South Australia.

Relative remoteness and accessibility, as measured by the Accessibility/Remoteness Index of Australia (ARIA), is depicted on this map by isolines (lines of equal ARIA value).

**Table 1. Communities with more than 200 people that are more than 80km from a hospital**

State Population	200-500	501-1000	1001-2000	> 2000
ACT	0	0	0	0
NSW	3	0	1	1
Vic.	0	1	0	0
SA	2	0	0	0
Qld	9	7	4	3
WA	15	6	3	0
Tas.	0	0	0	0
NT	19	11	6	1
<b>Total</b>	<b>48</b>	<b>25</b>	<b>14</b>	<b>5</b>

Source: [www.gjsca.adelaide.edu.au](http://www.gjsca.adelaide.edu.au)

**Table 2. Population characteristics of these communities, by state and territory**

	State Indigenous Population			Non-Indigenous Population			Total Population		
	Outside 80km	Total	Percent	Outside 80km	Total	Percent	Outside 80km	Total	Percent
ACT	0	2,870	0.0	0	296,375	0.0	0	299,245	0.0
NSW	1,103	101,456	1.1	57,397	5,937,233	1.0	58,500	6,038,689	1.0
Vic.	35	21,448	0.2	8,414	4,352,072	0.2	8,449	4,373,520	0.2
SA	2,541	20,409	12.5	3,911	1,407,534	0.3	6,452	1,427,943	0.5
Qld	9,746	95,321	10.2	45,299	3,273,523	1.4	55,045	3,368,844	1.6
WA	9,774	50,720	19.3	29,491	1,675,375	1.8	39,265	1,726,095	2.3
Tas.	161	13,889	1.2	2,384	445,771	0.5	2,545	459,660	0.6
NT	28,144	46,268	60.8	16,808	148,833	11.3	44,952	195,101	23.0
Total	51,504	352,381	14.6	163,704	17,536,716	0.9	215,208	17,889,097	1.2

Source: [www.gjsca.adelaide.edu.au](http://www.gjsca.adelaide.edu.au)

It is clear from Table 2 that again Indigenous people are more disadvantaged than are non-Indigenous people: while only 0.9% of the non-Indigenous population lives more than 80km from hospital, 14.6% of Indigenous people do.

## Distribution of beds

The distribution of public hospital beds across metropolitan, rural and remote areas and states and territories is given in Table 1. The availability of public hospital beds varies from 2.6 beds per 1,000 population in metropolitan areas, 3.3 beds per 1,000 population in rural areas and to 4.9 beds per 1,000 population in remote areas. Inevitably there is no precise fit between population and hospital services. For example, some metropolitan hospitals will also serve rural and remote residents. The higher rate of public hospital beds in rural and remote areas is probably due in part to the fewer number of private hospital beds in these areas, as well a “balance” to the relative lack of some health infrastructure in these areas that serves to keep people out of hospital. Also, many rural and remote hospitals have a high proportion of nursing home type patients who, in major cities are more typically cared for in nursing homes or hostels (AIHW 2001).

**Table 3. Distribution of hospitals and hospital beds across RRMA categories**

Region	NSW	Vic <sup>(a)</sup>	Qld	WA	SA	Tas	ACT	NT	Total
<b>Hospitals<sup>(a)</sup></b>									
Capital Cities	50	47	28	16	15	6	3	1	166
Other metropolitan centres	19	2	5	..	..	..	..	..	26
<b>Total metropolitan</b>	<b>69</b>	<b>49</b>	<b>33</b>	<b>16</b>	<b>15</b>	<b>6</b>	<b>3</b>	<b>1</b>	<b>192</b>
Large rural centres	11	6	8	..	1	2	..	..	28
Small rural centres	23	9	6	3	5	1	..	..	47
Other rural areas	97	77	53	33	46	13	0	0	319
<b>Total rural</b>	<b>131</b>	<b>92</b>	<b>67</b>	<b>36</b>	<b>52</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>394</b>
Remote centres	..	..	16	9	..	..	..	2	27
Other remote areas	16	2	71	29	13	2	..	2	135
<b>Total remote</b>	<b>16</b>	<b>2</b>	<b>87</b>	<b>38</b>	<b>13</b>	<b>2</b>	<b>..</b>	<b>4</b>	<b>162</b>
<b>Total all regions</b>	<b>216</b>	<b>143</b>	<b>187</b>	<b>90</b>	<b>80</b>	<b>24</b>	<b>3</b>	<b>5</b>	<b>748</b>
<b>Available beds per 1,000 population</b>									
Capital cities	2.6	2.4	2.9	2.6	2.8	3.0	2.2	3.5	2.6
Other metropolitan centres	2.8	2.9	2.2	..	..	..	..	..	2.6
<b>Total metropolitan</b>	<b>2.6</b>	<b>2.4</b>	<b>2.8</b>	<b>2.6</b>	<b>2.8</b>	<b>3.0</b>	<b>2.2</b>	<b>3.5</b>	<b>2.6</b>
Large rural centres	4.2	4.3	3.8	..	3.0	3.2	..	..	4.0
Small rural centres	3.0	3.8	2.4	2.4	4.6	2.3	..	..	3.1
Other rural areas	3.5	2.6	2.6	4.4	4.9	1.1	..	..	3.2
<b>Total rural</b>	<b>3.5</b>	<b>3.2</b>	<b>3.0</b>	<b>3.5</b>	<b>4.7</b>	<b>2.0</b>	<b>..</b>	<b>..</b>	<b>3.3</b>
Remote centres	..	..	4.1	4.2	..	..	..	6.3	4.5
Other remote areas	5.6	1.9	7.1	5.2	8.0	3.2	..	1.0	5.2
<b>Total remote</b>	<b>5.6</b>	<b>1.9</b>	<b>5.7</b>	<b>4.6</b>	<b>8.0</b>	<b>3.2</b>	<b>..</b>	<b>3.1</b>	<b>4.9</b>
<b>Total all regions</b>	<b>2.8</b>	<b>2.6</b>	<b>3.0</b>	<b>2.9</b>	<b>3.4</b>	<b>2.4</b>	<b>2.2</b>	<b>3.0</b>	<b>2.9</b>

<sup>(a)</sup> The number of hospitals reported can be affected by administrative and/or reporting arrangements and is not necessarily a measure of the number of physical hospital buildings or campuses.

<sup>(b)</sup> The count of hospitals in Victoria is a count of the campuses which report data separately to the Victorian Admitted Episodes Database.

.. Not applicable

Source: Australian Hospital Statistics 1999-00, AIHW 2001.

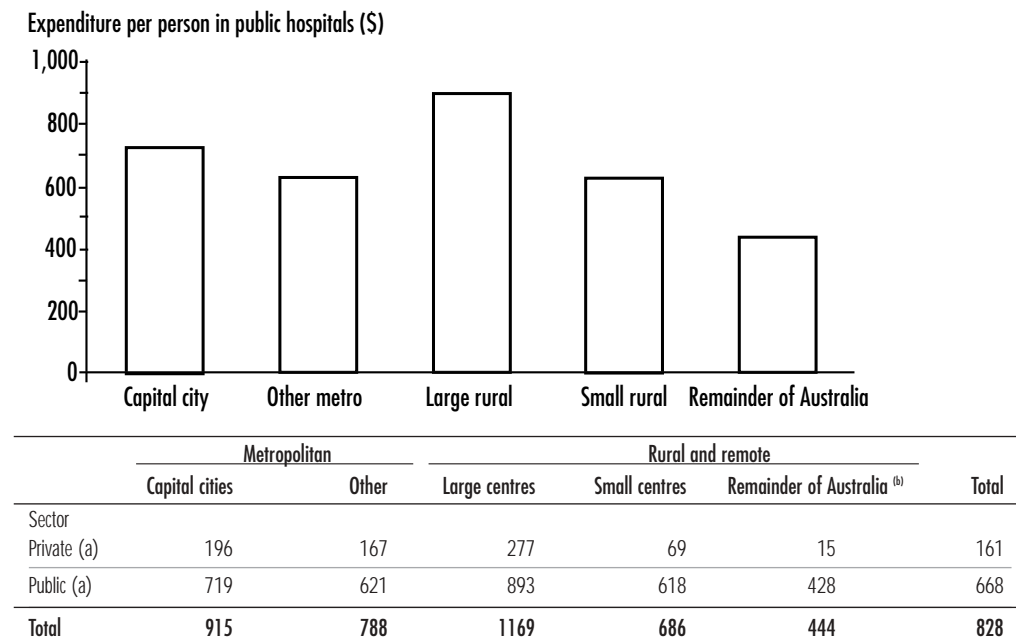
## Comparative costs

Nationally, the cost per casemix-adjusted separation in public hospitals was \$2,728 in 1999-00. This measures the average cost of providing care for an admitted patient, adjusted for the relative complexity of the patient's condition and hospital services provided. There is substantial variation in this figure, for example, Victoria reported the lowest cost per casemix-adjusted separation (\$2,529) and the Northern Territory reported the highest (\$3,444). For small rural acute care hospitals, the average cost was \$2,604, while for remote acute hospitals the figure was \$3,188. These variations reflect the variation in population served, health need, availability of practitioners and inherent running costs (AIHW).

When presented across the RRMA zones, acute care hospital expenditure per person is highest in large rural centres. Such hospitals find themselves in a position where many specialist services are provided to a population size that may not be large enough to achieve the economies of scale present in metropolitan hospitals. Hospitals in large rural

centers often have to be able to provide high-level specialist services (at high infrastructure cost), but at infrequent intervals. Smaller hospitals in smaller rural and remote centres do not face these expectations and more typically will not need to provide the more expensive equipment and services, and as a result, per person costs may be lower.

**Figure 4. Acute care hospital expenditure per person, 1995-96(\$)**



(a) Due to privacy restrictions, information on expenditure per available bed is not separately available for private hospitals in remote zones.

(b) 'Remainder of Australia' includes 'other rural areas', 'remote centres' and 'other remote areas'.

Notes 1. Based on daily average available beds for 1995-96 where available, and beds at 30 June 1996 where not available.

2. Includes expenditure on out-patient activity.

3. Based on patients' area of residence, not location of hospital

Sources: AIHW Hospital Establishments database; unpublished ABS data on private hospitals.

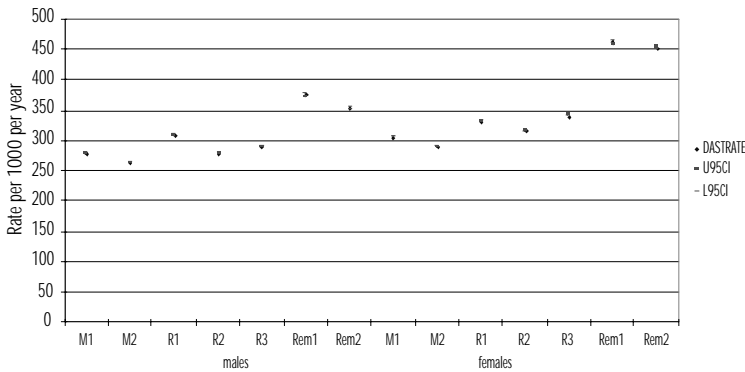
Compared with the metropolitan areas, rural and remote areas (excluding large rural centres) typically have lower levels of access to a range of medical specialists, general practitioners and retail pharmacists. As a consequence, such areas also typically have lower levels of utilisation of primary medical care remunerated through the Medicare Benefit Schedule (primarily general practitioner services). Generally, levels of use decrease with increasing rurality across the RRMA categories. However, some important measures tend to increase with increasing rurality. These include the number of part-time doctors, the number of patients who would otherwise typically be managed in a nursing home, the ratio of public to private hospital beds, and – importantly – the proportion of specialist consultations that occur outside the patient's region of residence (National Rural Health Alliance 1999).

For Australia as a whole, the private sector contributes around 32% of total health expenditure, private hospital admissions account for around a quarter of all hospital days and 70% of private hospital acute care activity is funded through health insurance. However, there are important differences in levels of private health coverage between capital cities and rural areas. The overall levels of coverage vary by state, but generally, private insurance participation rates are about 6% higher in capital cities compared with the rest of the state. While in part these differences reflect the lower level of availability of private health services for people outside capital cities, they also probably reflect socio-economic realities and the relatively lower income levels of people in rural and remote areas.

## Hospitalisation rates across Australia

However, there are quite substantial variations in hospitalisation rates for males and females, across the RRMA zones, for all Australians and for non-Indigenous people in South Australia, Western Australia and the Northern Territory.

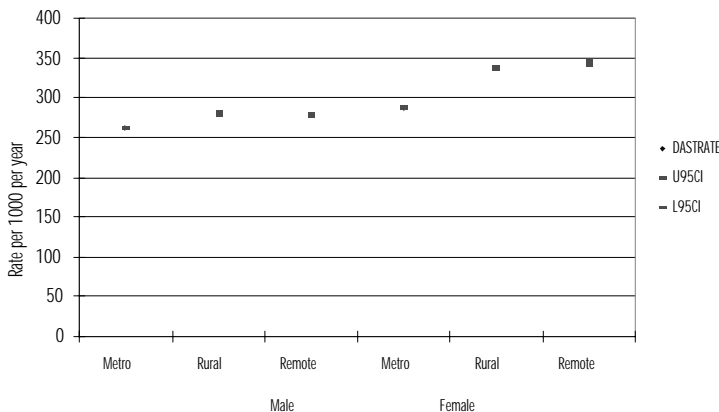
**Figure 5. Direct age standardised hospital admission rates, Australian residents, 1997/98, by RRMA category**



Notes: Rates are standardised to the 1991 Australian population.

Source: AIHW National Hospital Morbidity database.

**Figure 6. Direct age standardised hospital admission rates, non-Indigenous residents of South Australia, Western Australia and Northern Territory, 1997/98, by RRMA zone**



Notes: Rates are standardised to the 1991 Australian population.

Source: AIHW National Hospital Morbidity database.

The reasons for these differences have not been fully defined, but there seem to be several possibilities. Admission to hospital means different things in different places. Admission is determined by seriousness of illness; accessibility of the hospital (influenced by physical, financial, and cultural factors); admission practices and patterns (it is often said that admission is more likely in the country because some patients live too far away to manage as outpatients); and the (non) availability of alternative community services (Phillips 2002).



## Particular roles of rural hospitals

Because of the smaller size of the local community, hospitals in country areas often play different or additional roles from hospitals in capital cities. Hospitals in rural areas are more typically iconic, and have a dominant local profile. Along with the store and pub, the hospital is often a highly visible part of a small rural town and the associated community. Hospitals are typically major employers and hence a key driver of the local economy. Hospital closure – or at least the threat of closure – may have a profound effect on the local economy and psyche. Hospitals often have – or had – an important role as training institutions, which allowed local people to train locally. The move of nurse training to mainly urban universities has disempowered and disappointed many rural towns, whose young people now leave to train, and may never return. Increasingly, with the out-migration of young people from rural towns, the reduction in length of hospital stay, and the reduction (in some places) of procedural work done by general practitioners, many rural hospitals are taking on a more formal role as aged care facilities. As such, their social role and profile may actually increase, as services provided range from cradle to grave. However, without doubt, the types of services provided are changing (Humphries 2002).

Reflecting this change in service type is the need for a different workforce. In many rural hospitals, the number of births cannot justify a purely midwifery workforce, and the number of major operations done cannot justify a nursing workforce skilled in theatre and high care management. Instead, many Directors of Nursing talk about the need for nurses who have multiple skills and who can take their turn in providing antenatal care, birthing, managing emergencies, and providing aged care. Similarly, there is an increasing need for multiply-skilled therapists who can provide some physiotherapy, some podiatry, and occupational therapy, for example. Greater regional cooperation could conceivably lead to solutions whereby a physiotherapist could provide a regional service across a number of smaller rural hospitals.

These needs are in almost direct contradiction to the direction that the individual professional groups are moving, nationally and internationally. As in medicine, most are moving to even greater levels of sub-specialisation. These moves are anathema to the needs of rural and remote Australia, and are driven by the perceived needs of urban communities and by international trends. This is a fundamental challenge that must be grasped soon. While the unique needs of rural communities must be met by an appropriately trained workforce, we cannot afford to develop disciplines that are “rural-specific” as the great danger will be training people who can only ever work in the country. Going this route would risk making rural practice seem even more of a “dead-end” than is the perception now. Importantly, for Indigenous communities, there is substantial scope for extending the role of Aboriginal health workers to include that of the multi-skilled therapist.

The same challenge is faced by rural medicine. While now clearly a distinct discipline in many respects, rural medicine is fundamentally general practice. While many doctors do choose to live and work in rural Australia for varying periods of time great care must be taken not to develop training routes that exclude doctors from subsequent urban practice, as the reality is that many doctors move between country and city at different stages in their careers and lives, often as dictated by family needs.

## Multipurpose services

Multipurpose Services are integrated health and aged care services in receipt of Commonwealth funding for the provision of flexible aged care places. Commonwealth funding is provided in accordance with the terms of the *Aged Care Act 1997* and *Aged Care Principles 1999*. The joint Commonwealth/ State Multipurpose Services (MPS) Program aims to provide a flexible and integrated approach to health and aged care service delivery to small rural communities. The program is a response to a range of health and aged care challenges that may be evident in particular rural communities, including isolation from mainstream services, cost inefficiency of delivering discrete services to small populations, lack of local residential and aged care services, and/or duplicated and inconsistent accountability requirements for the multiple funding streams which can be received by small services. In the 2000 Federal Budget, the MPS program was subsumed into the broader Regional Health Services Program (RHSP). The RHSP broadened the scope of the program to include a more flexible range of locally identified health needs.

At a practical level the budget flexibility provided by the MPS program enables services to manage their funds in such a manner that:

- All or most health and aged care services provided within a particular community are integrated (ranging from acute hospital care to residential aged care, community health, and home and community care services) which means, for example, that consumers do not need to be assessed a number of different times by different providers; and
- Service planning and resource management are undertaken holistically, which enables local community involvement in decision making about service priorities and the capacity to move resources as priorities change.

Importantly, the MPS model also aims to enhance service viability. However, the program faces a number of challenges both now and in the future. These include:

- Recruitment and retention of suitable staff, as with many rural programs;
- Multi-skilling of MPS service staff and, in particular, attracting staff to work in aged care;
- Population decline coupled with ageing populations within rural communities potentially increasing the demand for health and aged care services in an environment where local industries are also in decline; and
- Ensuring that there is an appropriate balance struck between the provision of services at a local community level and the concentration of some services in larger regional centres.

## University Departments of Rural Health and Rural Clinical Schools

In the last five years or so the Commonwealth government has funded the establishment and expansion of a substantial rural academic network across rural and remote Australia. Starting with the clinical school in Wagga Wagga and the first 7 University Departments of Rural Health (UDRH), the network has now expanded to include 10 UDRHs and a rural clinical school associated with each medical school.

The longer established departments have all established strong links with regional health services and hospitals, including joint positions, collaboration on joint projects, collocation and shared governance arrangements. The UDRH and rural clinical schools have been responsible for the influx of a substantial number of new staff, many of who are senior and experienced academics, with substantial health service experience and expertise. The academic network is dependent upon rural hospitals to achieve its training and research goals, and rural hospitals are in a strong position to increase their own capability, capacity, resources and infrastructure as a result (Wilkinson et al 1999).

While not all rural hospitals will have a UDRH or rural clinical school on its campus, or indeed nearby, all of Australia is now essentially covered by the catchment areas of the network of UDRH and clinical schools. Rural hospitals should be encouraged to establish links with these potential academic partners, with the aim of seeking mutually beneficial collaborative relationships.

In many ways the recent period of high growth in rural health funding provided by the Commonwealth government in recent years, culminating in the \$500m committed in the 2000 Budget is over. We are unlikely to see major new rural health programs established or supported. The way forward is through more effective networking, partnerships and collaboration. The Multipurpose Services and the Regional Health Services programs offer additional funding to bring the various levels and types of health services together to create more effective and efficient service delivery models that uniquely meet the needs of rural communities. Working in partnership with the new rural academic network can only enhance these opportunities.

## Key challenges for the future

A key need is for rural hospitals to be an integrated component of rural and regional health services. Too often in the past, and now, hospitals have been too distinct from primary care services, whether public or private sector. Together with this need to integrate locally is a need to create networks and to integrate regionally, and across regions. Too often, individual hospitals have jealously guarded "their turf", while the way of the future seems to be in greater networking and collaboration.

If small hospitals cannot attract a physiotherapist due to size, workload, salary, social and professional constraints, maybe by coming together, a few hospitals in a regional network can provide a much more attractive opportunity. Similarly if a group of regional hospitals in one part of a state each have one resident obstetrician, instead of struggling (and paying large sums) to provide locum relief, they can come together to fund a regional obstetric position. Maybe in a large regional town with several small GP practices, each of which struggles to source locum services, each could fund part of a salaried GP position to provide shared locum services, while the local hospital provides half a salary to pay for the new GP to provide the anaesthetic sessions that it needs.

Formal partnerships between regions and metropolitan specialists services is also becoming increasingly important. The recent NSW Government Action Plan for Health has identified this as a key means of improving access and networking of rural hospital and health services. Improvements in telecommunication and telemedicine technology also offer considerable promise, and in many parts of Australia are already contributing to rural health service provision. Should large, urban tertiary centres be directly responsible for supporting designated regional hospitals in a formal and structured way?

What mechanisms exist or can be created to facilitate these collaborative practices, in an environment of highly fractured and fragmented funding mechanisms?

## Key messages

- Rural hospitals face similar and additional challenges to urban hospitals;
- There is great variation in characteristic, type and need among rural hospitals, reflecting heterogeneity of community and setting;
- Rural health differentials are largely driven by the poor status of Aboriginal health;
- Substantial differences in hospitalisation rates exist, with higher rates in rural and remote areas;
- Hospitals in larger rural centres face the challenge of providing services to many smaller surrounding communities in addition to their own town;
- The workforce needs – numbers and profile – of many rural hospitals are a particular challenge;
- Opportunities lie in greater networking and collaboration, as well as integration of services at the regional level, and linkages with metropolitan health services;
- The expansion of the rural academic network of university departments of rural health and rural clinical schools, provides a particular opportunity;
- The need to include newer technologies such as the internet, call centres and telemedicine.

## References

- Australian Institute for Health and Welfare 1998. *Health in rural and remote Australia*, AIHW Cat No. PHE 6, AIHW, Canberra.
- Australian Institute for Health and Welfare 2001. *Australian hospital statistics 1999-00*, AIHW, Canberra.
- DPIE (Department of Primary Industries and Energy) & DHS (Department of Human Services) 1994. *Rural, Remote and Metropolitan Areas Classification*, 1991. Census edition. Canberra: AGPS.
- Hugo G 2002. 'Australia's changing non-metropolitan population', in D Wilkinson, I Blue (eds) *The new rural health*, Oxford University Press, Melbourne.
- Humphries J 2002. "Health service models in rural and remote Australia", in D Wilkinson, I Blue (eds) *The new rural health*, Oxford University Press, Melbourne.
- National Centre for Social Applications in Geographic Information Systems.  
<http://www.gisca.adelaide.edu.au/gisca/flash.html>
- National Rural Health Alliance 1999. *Public hospital funding*. Submission to the Senate Community Affairs References Committee, November 1999. <http://www.ruralhealth.org.au/pubs>.

Phillips A 2002. 'Health status and utilisation of health services in rural Australia: a comparison with urban status and utilisation using national datasets'. In D Wilkinson, I Blue (eds) *The new rural health*, Oxford University Press, Melbourne.

Wilkinson D, Blue I, Symon B, Fuller J, & Smith M 1999. Establishing a new University Department of Rural Health: The first 2 years of the South Australian Centre for Rural and Remote Health. *Australian Journal of Rural Health* vol 4, pp 223-228.