Demographic and utilisation changes for rural and remote populations—subacute admitted care

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Over the last 20 years Jim Pearse has been an active participant and leader in health policy issues and research both within and outside of government. He established Health Policy Analysis Pty Ltd in 1993, a consulting firm focusing on health policy, analysis of health data for decision making, performance indicators, and health economics. Since 1993, Health Policy Analysis has undertaken a large number of consulting projects for the Commonwealth and state government, and non-government clients, including projecting demand for health services, costing, development of funding models and evaluation of health services.

Prior to establishing Health Policy Analysis, Jim spent 18 years working in various health and social policy areas within the public sector, most recently with the NSW Department of Health, and previously with the health and community services authority in the Northern Territory. In these roles Jim particularly focused on issues related to health service delivery, program evaluation, and funding for remote populations. Within NSW Health, Jim led work on the achievement of government equity objectives through resource allocation policies and models, the implementation of output oriented funding approaches for hospital services, and Commonwealth/state relations.

Jim's publications and research include: population based resource allocation models, the fiscal relationship between federal and state governments, casemix classification, efficiency of hospitals, costs of providing health services to Indigenous peoples, and measurement and international comparison of health system performance.

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Introduction

The provision of subacute care presents specific challenges to rural and remote health services given the ageing of the population, and the barriers in the provision of these services historically.

In recent years, subacute care has become a focus of national health reforms. In late 2008, the Council of Australian Governments (COAG) agreed to a partnership to improve efficiency and capacity in public hospitals.[1] Through the partnership, $500 million was provided to the states and territories over five years, in return for a commitment to increase subacute activity by an average of 5% per year. Subsequently, through the negotiations leading to the National Health and Hospitals Network Agreement[2], the Australian Government agreed to provide $1.62 billion to fund the capital and recurrent costs of an estimated 1,316 new subacute care beds by 2013-14[3], although in this instance subacute was interpreted as including rehabilitation, step down, mental health and palliative care beds.

In late 2009, the New South Wales (NSW) Department of Health commissioned a project to develop projections of admitted patient subacute services. The project was built on previous work undertaken in 2006.[4-6] The project combined an analytical approach, with qualitative input from clinicians, to identify issues to be examined in the first instance, and then to validate the projections results. The project resulted in admitted patient projections expressed in five-year intervals from 2016-17 through to 2031-32, and a software tool to facilitate access to the projection results and the development of scenarios.

In this paper we show the projection results for subacute care for rural populations in NSW and present some of the methodological issues relating to these. Overall, there is projected to be an 85% increase in demand for subacute bed capacity by regional and rural populations in NSW between 2008-09 and 2026-27. We conclude that the ageing of the population will have a significant impact on these regions.

Nature of subacute care

Subacute care is typically located on a spectrum with acute care on the one end, and nonacute care on the other. Historically, the concept of 'subacute' care has not been well defined. The term 'subacute' was introduced in Australia in 1992 in a project that examined the commonalities and differences in jurisdictional admitted patient data sets.[9] The recommendations from this report were adopted nationally and the *National*

Health Data Dictionary now includes a data element—'care type'—to identify the overall nature of the clinical service provided to admitted patients during an episode of care. The current definition[10] draws a distinction between acute care, rehabilitation, palliative care, geriatric evaluation and management, psychogeriatric care, maintenance care and other services provided by hospitals (such as those to newborns, hospital borders, and organ procurement). While a description is given for each care type, no distinction is drawn between acute, subacute and nonacute care types. Also, there remain issues concerning the consistency of assignment of episodes of care to these care type categories, and the search for better national definitions of subacute care continues.

The feature that separates subacute from acute and nonacute care is the principal factor impacting the goal of care and resource use. In acute care it is argued resource use is principally impacted by the patient's medical diagnosis, and consequently classifications that take diagnosis as the starting point, such as diagnosis related groups (DRG), are appropriate. In contrast, for subacute care, "care needs and treatment is driven primarily by the patient's functional status and quality of life, not the underlying diagnosis. Therapy is the dominant intervention, the goal of which is to maximise functional abilities and quality of life" (p. 6).[11] Subacute care aims to enhance patient outcomes over and above those that can be achieved when the clinical intent or treatment goal is to cure illness.[12] In contrast, for nonacute care, the main goal is maintenance of a patient's current functional status.

Subacute care is also time limited and centred on one or more treatment goals.[13-15] Although patients of all ages receive subacute care, it predominantly involves elderly patients.

A key objective of this project was to develop an understanding of the underlying trends in the provision of subacute care. However, not all features of subacute care are well captured in existing data sets. Subacute care can be provided in either an admitted or non-admitted setting, including in the community or home.[16] Subacute care can be preceded by an acute care episode, but this is not always the case. Importantly, the boundary between the 'acute' segment of a hospital stay and the 'subacute' segment has not been sufficiently well defined, and existing definitions are not always applied consistently. This reflects some of the difficulties in applying the underlying concept, but also that arrangements at local levels have a significant effect on how patient episodes are classified. In many hospitals, acute and subacute services occur in the same establishment, but for others, subacute patients are transferred to another facility. Subacute care often commences during the acute phase, for example, with the subacute specialist providing consultation and liaison services.

Methodology

Classification of subacute care

An initial task was the refinement of a classification that grouped components of subacute care into appropriate subcategories. The classification used for the 2006 subacute projections[5] was reviewed and updated, in particular taking into account the views of key clinicians. A description of the 16 categories in the classification used for the projections is at Appendix A. This classification split rehabilitation and palliative care episodes based on an analysis of reported diagnoses. Rehabilitation was split into 12 groups which are closely aligned with the functional impairment categories used for AN-SNAP. In contrast to the 2006 approach, 'orthopaedics' was split into 'joint replacements', 'fractures' and 'other orthopaedics'. Palliative care was split into three groups (cancer related, non-cancer related and same day). Psychogeriatric care was maintained as a separate group, although it was recognised that this form of care is not well identified in the data. Based on feedback from both geriatricians and rehabilitation physicians, geriatric evaluation and management episodes were grouped with the 'other rehabilitation' category.

A slightly different approach was taken for day only episodes. Overall the new classification resulted in 15 overnight patient groups and seven day only groups.

Overall approach to projections

The literature review conducted for this project identified a range of methodological approaches to projecting subacute activity.[6] Methods have included:

- The adoption of planning benchmarks based on rates of beds per population.

- Linkage of subacute demand to projections of acute demand, for example, identifying rehabilitation sensitive Diagnosis Related Groups (DRGs) and basing subacute projections on projections of these DRGs.
- Linking the demand for palliative care activity to estimates or projections of cancer deaths through palliative care 'capture rates'.
- Projection of future rates based on historical trends in service delivery.

All of these methods have limitations. For example, planning benchmarks (which are typically expressed in terms of rates per 1,000 population) are insensitive to changes in the demographic structure over time, do not directly account for differences in age structure between population groups, and do not take account of differences in need across population regions. Projections based on 'rehabilitation sensitive conditions'[1] push this core of the projections back to projections of acute activity. The approach is also sensitive to variations between services in the provision of rehabilitation. Projections based on past trends are impacted by previous and current patterns of supply, although various approaches can be employed to be more sensitive to demographic change.

For this project the approach adopted was to project historical trends into the future. This basic methodology has been applied widely in relation to acute services.[17-20] However, we supplemented these projections with several other perspectives. We translated the projected trends into beds per 1,000 population and compared this with planning benchmarks that have been discussed elsewhere. We also compared projections for major rehabilitation groups to projected activity for associated acute activity (e.g. joint replacements). Finally we obtained wide clinical input on the core projections.

The quantitative methodology is described in Figure 1. The approach involved five stages which are described below.

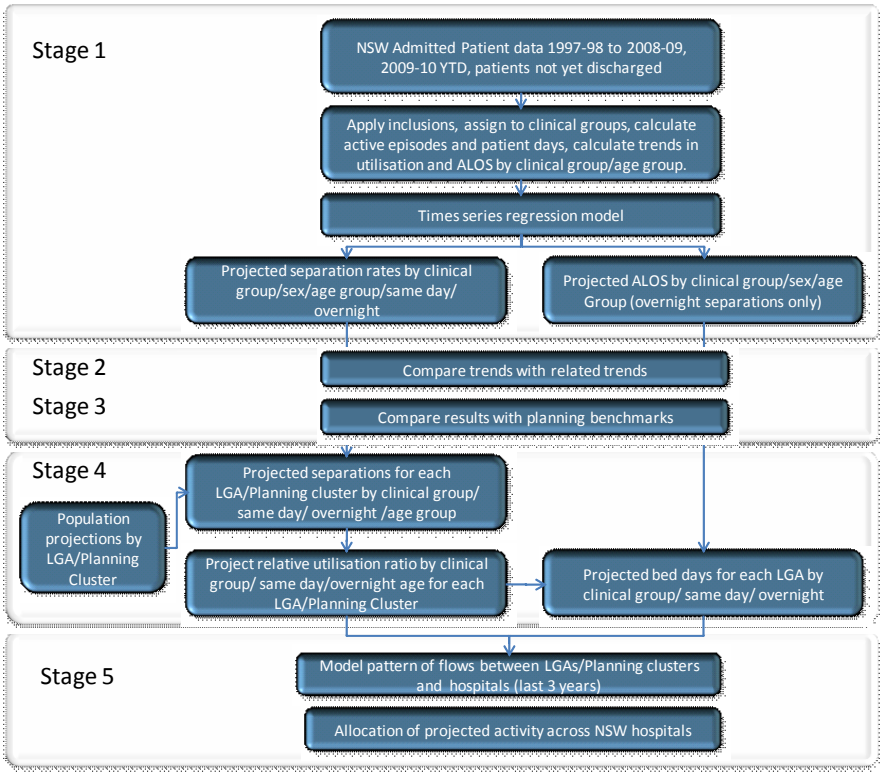

Figure 1 Overview of quantitative analysis methods

[1] That is, acute conditions for which rehabilitation is likely to take place during the latter part of their stay without a corresponding change in the care type of the episode from acute to subacute. Used as a proxy measure when bed days associated with rehabilitation are thought to be undercounted.

Stage 1

Data on hospital utilisation was obtained from The NSW Admitted Patient Data Collection for the years 1997-98 to 2008-09, along with population estimates for the corresponding periods. The hospital data included public and private hospitals across NSW, and NSW residents treated in public hospitals interstate.

In subacute care, it is not uncommon for patients to have long lengths of stay. Therefore, for this project, for episodes with days in hospital spanning across more than one financial year, an 'active' episode was recorded against each year. The number of days associated with the episode during each financial year was then assigned to that year. Consequently, for any one episode of care relating to a single patient, there may be active episodes and days recorded in more than one financial year.

The rate of episodes per 1,000 population was calculated for the 11 years of observation and applied to each of the 22 categories of subacute care, for five age groups (0-15, 16-44, 45-69, 70-84 and 85+ years) and for males and females. There were very few episodes recorded for the 0-15 year age group, and subsequently this age group was not included in the final set of projections.

Time series models were then estimated for each subacute category and age and sex group combination. Rates (active episodes) for future years were in turn projected from the estimated model. The functional form of the model estimated was:

$$Rate_i = \alpha + \beta * \log(Year_i - 1997)$$

Where:

$Rate_i$ is the number of active episodes per 100,000 population for the i^{th} year for a particular age/sex/clinical group.

$Year_i$ is the financial *i*. Financial years are coded as the year in which 30 of June for the particular financial year occurred. For example, 2008-09 is coded as 2009.

This functional form was preferred over a linear specification which had been used in previous projection exercises. A feature of the preferred specification is that where increasing rates are projected, the rate of increase will initially approximate the linear trend, but after some years will begin to taper and stabilise. Conversely, where decreasing rates are projected, the rate of decrease will taper and stabilise after a number of years. These characteristics were considered better approximations of future trends than linear projections (which assumes rates will increase for ever, or will decrease until they reach zero).

After examination of the modelled results, a number of other adjustments were made including:

- Setting the projected rate to the average for the three year period 2006-07 to 2008-09. This was appropriate where numbers of active episodes for a particular group were very small and the trends from previous years showed a high level of random variation.
- Setting the projected rate to the rate for 2008-09. This was applied where there appeared to be a significant change in recent years but no coherent trend over the full period modelled.

In addition to modelling numbers of episodes per 1,000 population, trends in average length of stay (ALOS) for overnight episodes were modelled, by applying a time series regression model to trends in ALOS for overnight active episodes for each age/sex/clinical group.

Stages 2 and 3

In stages 2 and 3, rates of growth resulting from the time series models were compared with related trends and various planning benchmarks. We examined projections of acute activity for joint replacements and other orthopaedic conditions based on a related set of projections for acute care.[20] We also examined projections of cancer related deaths prepared by the Cancer Institute NSW.[21] Trends were broadly comparable between these sources and the results of our analysis.

Projected rates were also compared with benchmarks that have been summarised in the NSW Health report on subacute projections.[4] We found that these benchmarks were generally less than the projected rates implied by the methods described above.

We concluded only minimal adjustments were necessary to the projected rates, and this was confirmed through consultations with various clinical groups.

Stage 4

In the fourth stage, relative utilisation (RU) ratios were calculated for each local government area (LGAs) in NSW for each combination of age, sex and clinical group, and then projected for future years. Smaller LGAs were combined to a level that was identified as being appropriate for health planners across NSW, with a total of 115 LGA groups identified in the final analysis. RU ratios reflect the extent to which actual activity for a particular LGA reflects the expected level of activity using state level rates.

As is expected in any analysis of health utilisation data, there is significant variation in activity between LGAs. This is exacerbated when analysis is undertaken for groups with small numbers of episodes across the state. Variation could reflect a number of factors including:

- measurement error (that is, reported activity is not appropriately captured or inappropriately captured)
- random variation (particularly where expected rates are very low)
- variation in need
- variation in the supply of subacute services
- differences in the pattern of care for certain regions. For example, in rural regions where geriatric, rehabilitation and palliative care specialists are not as readily available as in metropolitan regions, patients may be more likely to be assigned to less 'specific' categories of rehabilitation categories
- the availability of alternative care arrangements or carers
- differences in thresholds applied to determine whether a patient will be treated as an admitted patient, or transferred to a subacute program. For example, private hospitals are more likely to treat patients that would normally be seen on an outpatient basis in the public sector as a same day admitted patient.

For this project, assumptions concerning RU ratios in future periods needed to be developed. Following analysis, the recommended approach was different for the subgroups of subacute care. In general these approaches lead to a significant narrowing of the range of RUs across LGAs, particularly in the period up to 2016-17. In the case of cancer related palliative care, projected changes in RU ratios were related to projected cancer deaths by region that had been produced separately by the Cancer Institute NSW.[21]

Stage 5

A final stage of the project was to allocate projected demand across hospitals (public and private). It was assumed the pattern of utilisation in future years would reflect the pattern in the most recent three years for which data was available.

Clinical and stakeholder consultation

Consultation with key stakeholders was an important aspect of this project. This occurred at different stages throughout the project. Prior to undertaking the detailed projections, key stakeholders were interviewed and two workshops were held with clinicians and health service planners. These consultations canvassed issues concerning the scope of subacute care, the boundary with acute care, factors influencing trends over and above population growth and ageing, the impact of specific models of care, approaches to projecting activity, factors impacting on length of stay and factors impacting on differences in demand across geographic regions.

Once stage 1 was completed, the initial projections of utilisation rates and length of stay were published on the NSW Health Intranet site and comments were invited from clinicians and other stakeholders. Two

workshops were held, one with rehabilitation and aged care clinicians and another with palliative care clinicians. Feedback from clinicians and the workshops allowed for final adjustments to the projections approach to be made, including the grouping of clinical categories.

A summary of the approach that was settled on for each clinical category, along with approaches to other modelling issues, such as determining statewide rates, projecting ALOS and relative ALOS, is shown in Appendix B.

Approach to identifying rural and remote areas

The projections resulting from this project were produced for the 115 LGA groups across NSW. This paper focuses on presenting the final set of projections for rural and remote populations in NSW compared with populations in the major cities. In order to allocate the 115 LGA groups to these categories, we estimated Accessibility/Remoteness Index of Australia (ARIA) for each of the LGA groups. These were built up from ARIA+ values obtained at the ABS collector district level from the NSW Health Department for 2006. Based on the estimated ARIA+ value LGA groups were assigned to categories of major cities (less than 0.2), inner regional (between 0.2 and 2.4), outer regional (between 2.4 and 5.2) and remote (greater than 5.2). These reflected the accepted thresholds used by the Australian Bureau of Statistics in assigning geographical units to remoteness areas under the Australian Standard Geographic Classification. The remote and very remote areas were collapsed into one reference group for this paper. The level of the geographic unit used for this analysis (the LGA group) varies from other applications and consequently there will be slight differences is estimated populations for the relevant remoteness areas.

Results

Demographic projections

Demographic projections are a key driver of the activity projections presented below. A set of population projections developed by the NSW Department of Health[22] were used in this project. Table 1 highlights some of the features of these projections together with population estimates for December 2006. Over the period between 2006 and 2027, the overall NSW population is projected to grow by 25%. However, total population in major cities and inner regional areas is projected to grow at a much higher rate than outer regional and remote areas.

When the population aged over 70 years is considered, a very different picture emerges, and this is a key driver of the subacute projections. This aged component of the population is projected to increase by 70% over the twenty year period. Rates of growth are projected to be highest in inner regional areas. Growth in outer regional areas is expected to be similar to that of major cities. There is also significant growth projected for remote areas in the population aged over 70 years, even though the total population is projected to decline in these areas.

Table 1 Estimated and projected growth of NSW population in LGAs grouped to ABS Remoteness Areas, at December 2006 to December 2027

	Index with base of December 2006:					Share of NSW population:	
	2006	2009	2017	2022	2027	2006	2027
Total population							
Major Cities	100	104	115	122	129	58.1	60.2
Inner Regional	100	103	112	118	124	31.0	30.8
Outer Regional	100	101	103	104	104	10.1	8.4
Remote	100	97	91	87	84	0.8	0.5
Total	*100*	*103*	*113*	*119*	*125*	*100.0*	*100.0*
Population aged 70 years and over							
Major Cities	100	105	128	151	174	52.0	50.5
Inner Regional	100	107	134	161	190	34.9	37.0
Outer Regional	100	108	131	152	173	12.5	12.0
Remote	100	112	125	138	148	0.6	0.5
Total	*100*	*106*	*130*	*154*	*179*	*100.0*	*100.0*

Sources: Populations for the historical time series were based on the ABS Estimated Resident Population (ERP) for NSW for June 1997 to June 2007. Projections were based on NSW Health Population Projection Series 1, June 2009 (Amended Version)[22] for June 2011, 2016, 2021, 2026, 2031. These were interpolated to yield the ERP for December for each financial year. LGAs were assigned to remoteness area based on the population weighted ARIA+ index using data at the collector district level.

Projected activity

Table 2 summarises the projections of subacute activity for the combined public and private sectors. Table 3 summarises projections for the public sector only. The projections for the public and private sectors combined show active episodes (both day only and overnight) and patient bed days growing significantly over the next two decades.

A particular feature of these activity projections is the rapid increase in day only subacute episodes between 2001-02 and 2008-09. This was driven solely by increases in private hospital activity. Private hospital activity makes up 90% of same day subacute activity, principally related to day only rehabilitation episodes. This pattern of provision and the associated growth is assumed to have been driven principally by payment incentives around private health insurance. Advice provided by clinicians throughout the project indicated that patients treated as day only admitted patients in the private sector would mostly be managed as outpatients in the public sector. In considering the projections for day only activity adjustments to the historical trends were recommended, which resulting in a significant change in trends for future years.

For overnight episodes and associated bed days, projected admitted activity growth rates are generally higher for regional and remote LGAs compared with LGAs in major cities. This is the case for both the total activity and for public hospital only activity. There are significant increases in public hospital patient days projected, with an annual average level of growth of 2.5% projected for major cities and 3.8% for regional and rural populations. This translates into an indicative requirement that an increase of 50% in bed capacity is required in major cities and up to 85% in bed capacity for regional and rural populations between 2008-09 and 2026-27.

ALOS is projected to decline at a slightly slower rate than in the historical trend data period. This is principally driven by demographic shifts. ALOS is generally projected to decline for specific age and clinical groups. However, more episodes are projected to be provided to older patients, who also tend to have much longer lengths of stay.

Table 2 Historical and projected subacute activity by patient residence (major cities, regional and remote), NSW public and private hospitals, 2001-02 to 2031-32

		Major Cities				Regional and Remote			
			Overnight episodes				Overnight episodes		
Series type	Financial year ended 30 June:	Day only active episodes	Active episodes	Patient days	Average length of stay	Day only active episodes	Active episodes	Patient days	Average length of stay
Actual	2002	14,806	23,178	408,704	17.6	3,542	15,598	269,763	17.3
	2004	22,110	24,096	443,278	18.4	4,159	17,116	290,656	17.0
	2006	28,910	26,369	468,956	17.8	8,837	17,220	290,325	16.9
	2009	53,478	29,681	511,911	17.2	18,782	19,471	315,609	16.2
Projected	2017	61,872	35,785	612,064	17.1	23,240	26,309	439,744	16.7
	2022	70,164	40,674	691,430	17.0	27,831	30,620	509,000	16.6
	2027	78,456	46,146	780,820	16.9	32,304	35,312	585,169	16.6
Average annual growth rates:	2002 to 2009	23.9%	4.2%	3.8%	-0.4%	32.1%	3.8%	2.7%	-1.1%
	2009 to 2022	2.3%	2.6%	2.5%	-0.1%	3.2%	3.6%	3.7%	0.1%

Note: Excludes patients resident interstate treated in NSW

Table 3 Historical and projected subacute activity by patient residence (major cities, regional and remote), NSW public hospitals only, 2001-02 to 2031-32

		Major Cities				Regional and Remote			
			Overnight episodes				Overnight episodes		
Series type	Financial year ended 30 June:	Day only active episodes	Active episodes	Patient days	Average length of stay	Day only active episodes	Active episodes	Patient days	Average length of stay
Actual	2002	6,908	15,079	292,898	19.4	304	11,339	217,389	19.2
	2004	6,647	15,766	316,401	20.1	396	12,876	233,050	18.1
	2006	3,000	16,958	325,009	19.2	285	12,662	225,005	17.8
	2009	6,871	18,214	335,381	18.4	495	13,306	222,723	16.7
Projected	2017	8,598	22,171	401,280	18.1	1,642	18,479	318,523	17.2
	2022	9,741	25,226	453,389	18.0	2,322	21,346	365,643	17.1
	2027	10,986	28,714	512,464	17.8	3,007	24,474	417,114	17.0
Average annual growth rates:	2002 to 2009	-0.1%	3.2%	2.3%	-0.9%	8.5%	2.7%	0.4%	-2.2%
	2009 to 2027	2.8%	2.7%	2.5%	-0.2%	11.2%	3.6%	3.8%	0.1%

We were able to estimate the relative contribution for four key factors to increases in projected activity for major cites (Figure 2) and regional and remote areas (Figure 3). For major cities, population growth and ageing effects are projected to have a similar impact over the period to 2026-27. In contrast, ageing of the population is projected to be a much more significant factor for regional and remote populations. Utilisation rate increases over and above ageing and demographic effects are projected to be important across major cities regional and remote areas. For bed day use, the combined impacts of population growth, ageing and utilisation are partly offset by reduced lengths of stay.

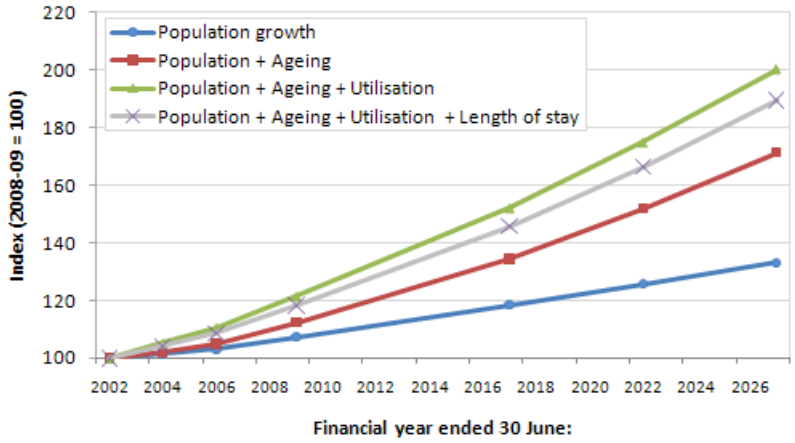

Figure 2 **Key factors contributing to activity growth (overnight activity) in major cities NSW, public and private hospitals 2001-02 to 2026-27**

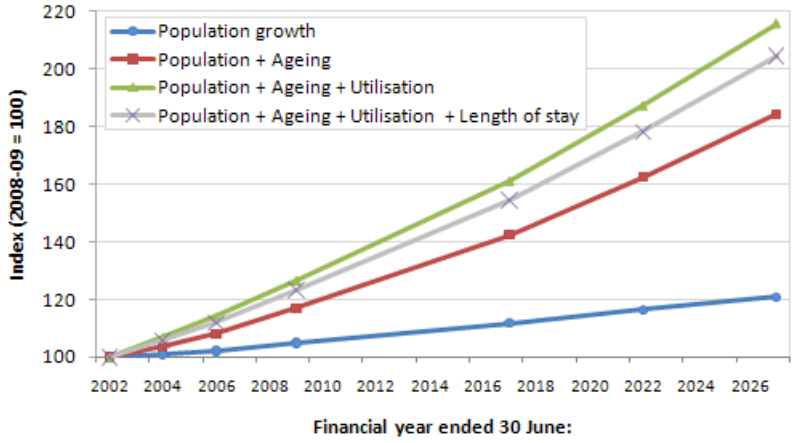

Figure 3 **Key factors contributing to activity growth (overnight activity) in regional and remote NSW, public and private hospitals 2001-02 to 2026-27**

Table 4 shows total projected patient days for public hospitals by the clinical sub- groups. Across the clinical groups projected rates of increase in demand for inpatient care are generally higher for regional and remote areas. Regional and remote areas are projected to have relatively higher annual rates of increase in demand for rehabilitation for orthopaedics issues (particularly fractures and other orthopaedics), cardiac conditions, arthritis, pulmonary conditions, other rehabilitation and psychogeriatric care.

Table 4 **Projected patient days (for overnight episodes) for subacute care by patient residence (major cities, regional and remote), public hospitals only, 2008-09 to 2026-27**

	Major Cities					Regional and Remote				
	2008-09	2016-17	2021-22	2026-27	Average Annual Increase	2008-09	2016-17	2021-22	2026-27	Average Annual Increase
Patient (Overnight) Days										
010 Stroke	49,073	54,599	59,130	64,127	1.6%	37,348	48,788	53,218	57,883	2.6%
020 Brain Dysfunction	8,795	9,798	10,352	10,983	1.3%	4,713	5,722	5,986	6,266	1.7%
030 Neurological Conditions	11,688	14,078	15,697	17,378	2.4%	9,233	11,896	13,312	14,702	2.8%
040 Spinal Cord Injury	10,359	10,539	11,242	11,972	0.9%	8,648	10,363	10,804	11,205	1.5%
050 Amputation of Limb	6,694	9,747	11,148	12,597	3.8%	8,445	11,869	13,055	14,295	3.1%
060 Arthritis	7,169	8,993	10,119	11,398	2.8%	3,902	6,054	7,061	8,162	4.4%
081 Orthopaedic - Fractures	63,327	80,444	92,100	106,374	3.1%	39,910	61,582	73,506	87,477	4.7%
082 Orthopaedic - Joint Replacement	9,488	11,949	14,149	16,506	3.3%	6,635	12,523	15,346	18,180	6.1%
083 Orthopaedic - Other	24,133	28,576	33,584	39,362	2.9%	13,607	22,201	27,045	32,351	5.2%
090 Cardiac	11,312	14,197	16,339	18,923	3.1%	6,314	9,514	11,378	13,526	4.6%
100 Pulmonary Conditions	7,905	9,534	10,675	12,042	2.5%	3,780	6,106	7,023	8,092	4.6%
160 Other Rehabilitation	40,982	52,013	59,397	68,083	3.0%	33,133	46,978	54,911	63,773	3.9%
Total Rehabilitation	*250,925*	*304,467*	*343,932*	*389,744*	2.6%	*175,668*	*253,596*	*292,647*	*335,911*	*3.9%*
200 Palliative Care - Cancer Related	61,021	64,073	71,140	78,477	1.5%	36,837	51,071	57,173	63,271	3.2%
210 Palliative Care - Non-Cancer	7,597	9,224	10,655	12,327	2.9%	7,167	7,949	9,059	10,340	2.2%
Total Palliative Care	*68,618*	*73,296*	*81,795*	*90,803*	1.7%	*44,004*	*59,020*	*66,232*	*73,611*	*3.1%*
400 Psychogeriatric Care	15,838	23,516	27,663	31,918	4.2%	3,051	5,908	6,764	7,592	5.5%
Total subacute care	***335,381***	***401,280***	***453,389***	***512,464***	***2.5%***	***222,723***	***318,523***	***365,643***	***417,114***	***3.8%***

Note: Excludes patients resident interstate treated in NSW

Discussion

The projections presented in this paper highlight several significant challenges in planning for the health service needs of regional and remote populations in NSW. While these populations are not expected to experience the same level of overall growth projected for major cities, the impact of the ageing of the population will be a significant issue.

Historically, specialised subacute services for these populations have tended to be lacking, and some of the projected increase in demand reflects a degree of 'catching up'. Utilisation rates for subacute services across the state have been increasing at levels in excess of population growth and ageing effects, and these trends for subacute care are likely to continue. The combined impact of these factors suggests that there needs to be significant investment in the growth of subacute services in regional and remote parts of the state. The underlying demand projections suggest that bed capacity will need to almost double over the period between 2008-09 and 2026-27 in these areas.

An important question health service planners and clinicians need to ask is whether there are models of care, other than admitted subacute services, that would be more appropriate. These may be particularly relevant in regional and remote areas as a result of workforce issues (i.e. supply of specialist physicians and allied health practitioners) and lack of transport.

As with all projections, there are several limitations that need to be considered by health service planners and decision makers. The underlying demographic projections have a level of uncertainty, and in particular are sensitive to assumptions about future fertility, mortality and internal migration rates. As discussed above, the identification of subacute activity has been problematic, and it may be significantly under-identified. Historical trends that reflect a level of unmet demand may be misleading in considering future requirements. There may be other factors impacting on need in a local community that should to be considered in planning the provision of subacute services. The role of private providers also needs to be considered.

These issues have been given some prominence in documentation and guidance issued along with the subacute admitted patient projections. The projections and the associated software tool developed are intended only as a common starting point for planning health services.

Conclusions

This paper has described an approach to developing projections for subacute care that combined quantitative and qualitative assessment of available data and interpretation of that data. Health services in regional and remote NSW will face significant growth in demand for subacute care over the next two decades. The projections discussed here will be a useful first step in planning to better address these needs. However, the limitations need to be well understood and alternative models of care should be considered as viable options throughout the planning processes.

Appendix A Clinical groupings of subacute care

S*i*AM clinical group	Care type (service category)	Diagnoses (ICD-10-AM codes) - principal diagnosis and six others examined	Hierarchy	Same day/overnight treatment
Rehabilitation				
010 Stroke	Care type is 2 (rehabilitation) or 7 (GEM); or the care type is 1 (acute) and the DRG is Z60A to Z60C (admission for rehabilitation); or the care type is '1' and the DRG is B60A, B60B and the principal diagnosis is Z50 (rehabilitation)	G45, G81, I69	5	SD episodes to 0101 Stroke - Same Day
020 Brain Dysfunction		G93.1, S06, T90	4	SD episodes to 1601 Other Rehabilitation - Same Day
030 Neurological Conditions		G10-G29, G37, G62	3	
040 Spinal Cord Injury		G82, G95, S14.1, S14.7, S24.1, S24.7, S34.1, S34.7	1	
050 Amputation of Limb		I70.2, S48, S58, S68, S78, S88, S98, T02, T05, Z89.1, Z89.2, Z89.3, Z89.4, Z89.5, Z89.6, Z89.7, Z89.8, Z89.9	6	
060 Arthritis		M05-M25	9	
080 Orthopaedic Conditions				SD episodes assigned to 0811 Fracture - Same Day; 0821 Joint Replacement - Same Day; and 0831 Other Orthopaedic Same Day
081 Fractures		Spinal or neck fracture: S22.0-S22.1, S12, T08; Lumbar Spine and Pelvis Fracture: S32; Hip Fracture: S72; Other Limb Fracture: S42, S52, S62, S82, S92	2	
082 Joint Replacement		Hip Replacement: T84, Z96.64; Knee Replacement: Z96.65	7	
083 Other Orthopaedic		Osteoporosis: M69-M82; Musculoskeletal conditions: M30-M39, M83-M99; Spinal Condition (not Spinal Cord Injury): M40-M54	8	
090 Cardiac		I20-I25, I30-I52, I70.0, I70.1	10	SD episodes to 1601 Other Rehabilitation - Same Day
100 Pulmonary Conditions		J10-J18, J43-J44	11	
160 Other Rehabilitation		Other diagnoses within rehab care type and GEM care types.	12	
Palliative Care				
200 Palliative Care - Cancer-Related	Care type is 3 (palliative care)	All C codes (neoplasms) and D00-D48	1	SD episodes (excluding deaths) to 2201 Palliative Care - Same Day
210 Palliative Care - Non-Cancer		All other codes	2	
400 Psychogeriatric care	Care type is 8 (psycohgeriatric) - Excludes episodes in psychiatric hospitals			Not separately grouped
520 Maintenance	Care type is 4 (maintenance); or the care type is 1 (acute) and the principal diagnosis is Z74 (need assistance) or Z75 (waiting admission elsewhere)			Not separately grouped

Appendix B Summary of approaches adopted for projecting specific substreams of subacute care

	Projections methods for statewide rates	Projections methods for ALOS	Relative utilisation approach	Relative ALOS	Occupancy Rates
Rehabilitation					
Day Only	Time series regression model to project trends in separation rates for each age/sex/clinical group with some adjustments	Not applicable (ALOS=1)	The absolute difference between expected and actual activity for each LGA (based on the 2006-07 to 2008-09 years) assumed to apply in future years	Not applicable (ALOS=1)	90%
Overnight:					
Brain Dysfunction and Spinal Injury	Time series regression model to project trends in separation rates for each age/sex/clinical group	Time series regression model to project trends in ALOS for each age/sex/clinical group	RU set to 100 for all LGAs	Based on hospital for which activity is projected	90%
Other overnight rehabilitation	Time series regression model to project trends in separation rates for each age/sex/clinical group with some adjustments	Time series regression model to project trends in ALOS for each age/sex/clinical group	(a) Difference between the current RU ratio (based on the 2006-07 to 2008-09 years) and the statewide rate (100) will reduce by a third by 2016-17 (b) RUs restricted to be between 50 and 200 (c) From 2016-17, the absolute difference between projected and expected activity for 2016-17 applies.	Relativities based on following groupings (based on peer groups): Sub acute facilities, rural facilities (including MPSs), other public facilities, private hospitals.	90%
Palliative Care					
Day Only	Activity reported in 2008-09 brought forward	Not applicable (ALOS=1)	Activity reported in 2008-09 brought forward	Not applicable (ALOS=1)	90%
Overnight:					
Cancer Related	Time series regression model to project trends in separation rates for each age/sex group	Time series regression model to project trends in ALOS for each age/sex group	Estimated using projected number of cancer related deaths. Adjustments made to (a) avoid the projections resulting in a significant decrease/increase on current levels of activity for a particular region and (b) average RUs across similar regions	Relativities based on following groupings (based on peer groups): Sub acute facilities, rural facilities (including MPSs), other public facilities, private hospitals.	90%
Non Cancer Related	Time series regression model to project trends in separation rates for each age/sex group with some adjustments	Time series regression model to project trends in ALOS for each age/sex group	(a) Difference between the current RU ratio (based on the 2006-07 to 2008-09 years) and the statewide rate (100) will reduce by a third by 2016-17 (b) RUs restricted to be between 50 and 200 (c) From 2016-17, the absolute difference between projected and expected activity for 2016-17 applies.	Relativities based on following groupings (based on peer groups): Sub acute facilities, rural facilities (including MPSs), other public facilities, private hospitals.	90%
Psychogeriatrics					
Overnight	Activity reported in 2008-09 brought forward	ALOS reported in 2008-09 brought forward	Activity reported in 2008-09 brought forward	Based on hospital for which activity is projected	90%
Maintenance					
Overnight	Time series regression model to project trends in separation rates for each age/sex group	Time series regression model to project trends in ALOS for each age/sex group	(a) The average RU ratio for metropolitan regions was calculated and then assumed to apply across all metropolitan regions (around 70) (b) The rural based RU ratios were based on the absolute difference between actual and expected activity for 2006-07 to 2008-09 years	For rural areas this was based on hospital for which activity is projected	90%

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