

# **Hopitalisation rates and costs by socioeconomic status, New South Wales, 1996-97 and 2000-01**

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## **Abstract**

In this paper we examine trends between 1996-97 and 2000-01 in the patterns of hospitalisation of the NSW population. The bases of the analyses are a unique administrative data series on NSW hospital utilisation and Census data for 1996 and 2001. Having full population datasets allowed us to study with accuracy hospitalisation patterns at highly disaggregated levels – by hospital type, age, sex and socio-economic status.

We found that in NSW the poor used public hospitals more than the rich – with patients in the poorest socio-economic group having had a 21 per cent higher hospitalisation rate in 1996-97 than patients in the richest such group. However for private hospitals this pattern was reversed - with patients in the poorest socio-economic group having a 19 per cent lower hospitalisation rate than patients in the richest such group.

Other findings were that, despite little change in the utilisation of public hospitals over the period, public hospital expenditures increased - in current prices - more rapidly (22%) than expenditures in private hospitals (17%). One explanation arises from the significant growth that occurred in the use of public hospitals by the 70+ age group – a group for which hospital costs are much higher than the average. Finally we found that, while in 1996-97 private hospital costs in NSW were mainly met by individuals through health insurance and/or direct payments (90%), by 2000-01 only 60% of such costs were met by individuals (due to considerable increases in government subsidies over the period).

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## Acknowledgments

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We would especially like to thank Andrew Gibbs and Durham Bennett from the NSW Department of Health for their valuable assistance in compiling and interpreting the NSW datasets used in this study. Thanks are also due to Mandy Yap of NATSEM for much appreciated help with the data analyses.

## Contents

<b>1</b>	<b>Introduction</b>		<b>4</b>
1.1	Background	4	
1.2	Aims	4	
<b>2</b>	<b>Data and methods</b>		<b>5</b>
2.1	Data	5	
2.2	Methods	6	
<b>3</b>	<b>Findings</b>		<b>8</b>
3.1	Hospitalisation patterns by socioeconomic status, 1996-97	8	
3.2	Changes in the size and age composition of the NSW population, 1996-97 and 2000-01	12	
3.3	Trends in hospital use per capita, 1996-97 and 2000-01	13	
3.4	Technological change and costs of hospitalisation, 1996-97 and 2000-01	15	
<b>4</b>	<b>Summary of Findings</b>		<b>19</b>
<b>A</b>	<b>Standard errors and statistical significance</b>		<b>20</b>
<b>B</b>	<b>Hospitalisation rates by sex, 1996-97</b>		<b>21</b>
	<b>References</b>		<b>23</b>

# 1 Introduction

This paper is one of a series of publications reporting on findings from a three year Australian Research Council grant. The Industry Partners to this grant are the NSW Health Department, the Health Insurance Commission and the Productivity Commission. See details in earlier publications (Thurecht et al 2002, 2003a, b and c).

## 1.1 Background

Although in recent decades the health of populations in developed countries like Australia has improved dramatically, the related expenditures tended to outpace economic growth. This forced governments to find new funds or to pass a larger share of the costs onto individuals. Nations have also tried to contain costs, most typically in the hospital sector. In 2001, 72 per cent of health spending in OECD countries was met by government, the remaining 28 per cent having been the responsibility of private sources – mainly private insurance and individuals' own resources (OECD 2003a and b).

In Australia, health expenditure as a share of GDP increased from 8.2 to 9.3 per cent in the ten years to 2001-02. That year, 68 per cent of total health expenditure was funded by government (Commonwealth and State) and the hospital sector accounted for 35 per cent of recurrent expenditure on health goods and services (AIHW 2003, pp.9, 38 and 18 respectively).

## 1.2 Aims

In this paper we study changes in hospitalisation rates and costs in NSW by age, sex and socioeconomic status. Changes will be examined between 1996-97 and 2000-01. Trends will be considered across the hospital system, as well as separately for public and private hospitals. The issue of how hospitalisation costs were shared between government and individuals will also be addressed.

## 2 Data and methods

### 2.1 Data

#### *NSW hospital statistics*

In preparing this paper we studied time series hospitals data from 1996-97 to 2000-01. The data were sourced from the NSW Health Department's 'Inpatient Statistics' and its 'Hospital Cost Data' collections. Psychiatric hospitals and patients who resided interstate or overseas, but were treated in NSW Hospitals, were excluded. Thus the data covers all in-patient admissions (and separations) of NSW residents at public hospitals (excluding non-psychiatric hospitals). The datasets identify public and private hospitals separately. It is important to note that the separations are not casemix weighted.

To transform the original NSW hospitals data into a form suitable for our analyses, a number of enhancements have been carried out. First, the initially separations-based datasets were converted by NSW Health officials into a patient-based dataset. This was done through probabilistic linking of separation-based records by such variables as patients' addresses and dates of birth. Through this process, separations by patients who entered NSW hospitals more than once during the year for the same service type were amalgamated into a single patient record. This enhancement was completed for each of the years between 1996-97 and 1999-00.<sup>1</sup> For 2000-01, the linking has not as yet been finalised.

Second, socioeconomic status was imputed to each patient in the hospitals dataset based on their age, sex and geographic area of their residence (at the Census Collector District, or CD, level). While in many earlier studies the same socioeconomic status (SES) was imputed to all patients living in the same geographic area,<sup>2</sup> in this paper we adopted a less 'blunt' indicator of SES. We used an equivalent family income (EFI) measure, which was computed for us by the Australian Bureau of Statistics (ABS) from its 1996 Census and then grouped into quintiles of the NSW population. To give an example, if the NSW hospitals administrative data showed that four 5 to 9 year old boys living in a particular CD were admitted to NSW hospitals in 1996-97, and if the Census data supplied by the ABS showed us that half of all 5 to 9 year old boys living in that CD belonged to families in the top equivalent income quintile and the other half belonged to families in the middle income

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<sup>1</sup> Of about 1.2 million patients in 1999-00, nearly 30 per cent had more than one separation.

<sup>2</sup> See for example Hayen et al (2002), Turrell and Mathers (2000), Vinson (1999), Mathers et al (1999) and Mathers (1996, 1995 and 1994).

quintile, then we randomly assigned two of the boy patients to the top equivalent family income quintile and the remaining two to the middle equivalent family income quintile. For fuller details of the methodology see Thurecht *et al* (2003b).

The EFI measure has two key advantages over the more traditional method of assigning SES or SEIFA indexes<sup>3</sup> to all those living within a particular CD.<sup>4</sup> First, assigning the same SES to all of those living within a particular CD implies that all families living within the CD have the same socio-economic status when, in reality, families of both high and low socio-economic status may live within that CD. Second, our EFI measure of socioeconomic status takes greater account of the economic resources available to different families living within a CD. For example, a single person with a gross income of \$50 000 and a couple with three children with a gross income of \$50 000 do not have the same level of resources, because the income of the second family is being used to support five people rather than just one. Applying an equivalence scale to the gross incomes of families of different size and composition – as we have done in this project – is a widely used way of improving the accuracy of the measure of the relative economic wellbeing of families (see for example ABS, 2003a, p 13).

Further details on the way the projections to 2009-10 had been carried out are in Thurecht *et al* (2003c).

## 2.2 Methods

### *Hospitalisation patterns by socio-economic status*

With the 1996-97 data - the processing of which is more advanced - we were able to study hospitalisation rates by age, sex and socioeconomic status. Appendix A describes the method used for assessing statistical significance for our estimates of the differences in the hospitalisation rates between low and high socioeconomic groups - Section 3.1. As will be seen in that Section, our estimates were invariably found to be highly significant statistically. This is a common feature of studies using very large samples - such as our full population Census and hospitals datasets.

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<sup>3</sup> These are the geographic area based Socioeconomic Indexes for Areas (SEIFA), published by the ABS. They are constructed by applying principal component analysis to Census data - so that geographic areas at the Census Collector District level can be ranked by socioeconomic status – ABS (1998a).

<sup>4</sup> Examples of earlier publications using SEIFA indexes as indicators of SES are in footnote 2.

## *Trend Analyses*

In this paper we also compare trends across two years, 1996-97 and 2000-01, the two extreme years in our historical time series. Although in other work we have examined the intervening years of 1997-98, 1998-99 (Thurecht et al 2002) and 1999-00 (Thurecht et al 2003a and c), results for these years are not reported in this paper. This is because the trends observed between 1996-97 and 2000-01 were found to be relatively steady in the intervening years.

The advantage of focussing on the two NSW hospitals 'end-years' is that they each correspond to a Census year: 1996-97 hospitals data to the 1996 Census and 2000-01 hospitals data to the 2001 Census. Being able to compare trends across two years for which we have full population data for both hospitals and NSW residents has the great advantage of allowing us to disaggregate to lower levels than what is generally possible. In our case, being able to disaggregate to the level of the most intense hospital user group - patients aged 70 years or more - and to be able to do that at the sex, SES and type of hospital level - resulted in an ability to report relatively minor but potentially important trends with considerable confidence.

## *Age standardisation*

When comparing hospitalisation rates between 1996-97 and 2000-01, we age standardised the results by hospital type to the 2001 NSW population, using the five broad age groups reported on in this paper. As expected, there was little difference between the 'standardised' and 'non-standardised' estimates, due to the relatively small changes in the age composition of the population that occur in a five year period.

For analyses of hospitalisation patterns by socio-economic status we chose to control for age by presenting results at the broad age group level.

## *Validation of findings*

Throughout the analyses we checked our aggregate findings against statistics published by organisations such as the ABS, the Australian Institute of Health and Welfare (AIHW 1998, 2002 and 2003) and the NSW Health Department

## **3 Findings**

### **3.1 Hospitalisation patterns by socioeconomic status, 1996-97**

We defined the risk of hospitalisation as the ratio of the number of hospital patients to the corresponding NSW population.<sup>5</sup> Figure 1 illustrates how the risk of hospitalisation varied in 1996-97 by age, socioeconomic status and type of hospital.<sup>6</sup> It shows that that risk increases with age – and dramatically so from age 60 onwards.

Considering public hospitals only, there is a clear trend for a higher proportion of low SES (ie low EFI quintile) people to be hospitalised than high SES people. For private hospitals – which accounted for 34% of hospital patients that year – there was an even clearer pattern, but in the opposite direction. That is that better off persons – and especially those in the top EFI quintile – tended to use private hospitals more than people in the lower EFI quintiles.

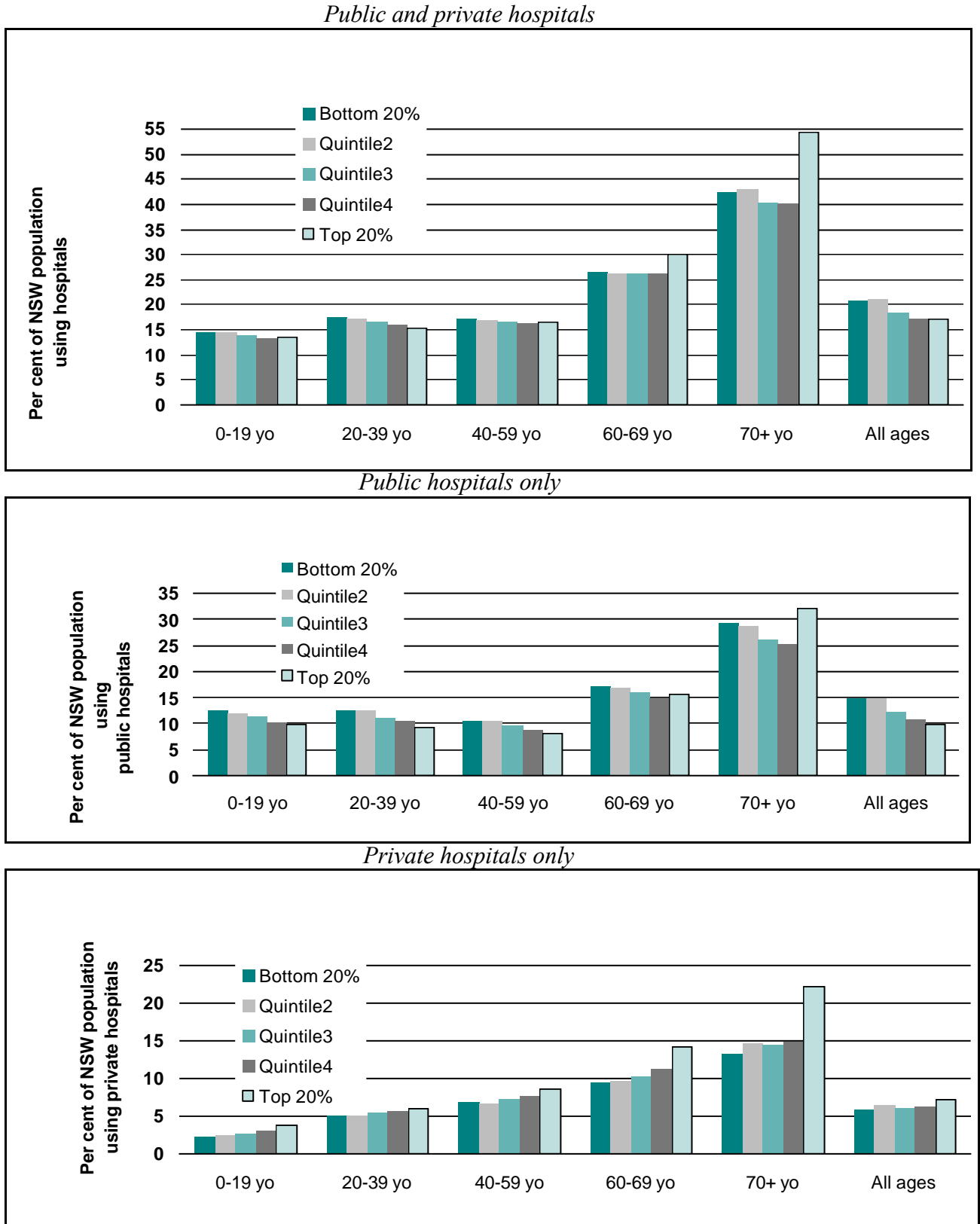
The outcome of these opposing trends is that, when considering all hospitals in NSW, individuals from lower SES families have a somewhat higher risk of hospitalisation than those from higher SES families (see also Thurecht et al 2002). A particularly striking finding is that, amongst those aged 70 years or more, patients who use public and private hospitals most belonged to the highest quintile. In 1996-97, there were over 10,000 top quintile hospital patients in the 70+ group (representing 54 per cent of top EFI persons aged 70+ in the NSW population).

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<sup>5</sup> In this Section we were able to carry out analyses on a patient basis, because we are only considering the year 1996-97. In all other Sections the analyses were carried out on a separation basis. This was necessary for purposes of comparisons with the 2000-01 data for which separations had not as yet been grouped on a patient basis (Section 2.1)

<sup>6</sup> Because some patients had separations in both public and private hospitals, the ‘public only’ and ‘private only’ charts contain some double counting of patients (around 5 per cent).

Figure 1: Per cent of NSW population using NSW hospitals,\* by age and imputed equivalent family income quintile. 1996-97



\* NSW residents admitted to hospital at least once that year divided by the relevant age and SES specific population numbers.

Sources: enhanced NSW hospitals and 1996 Census data.

In searching for some explanation for the high hospital usage by 70+ year olds in the top EFI quintile, we examined the statistics on private health insurance (PHI) membership in the 1996-97 NSW hospitals dataset. We found that 76 per cent of 70+ year old top EFI quintile patients in private hospitals had reported in their hospital admission questionnaire that they had PHI cover (compared with 69, 66, 62 and 65 per cent for 70+ year old quintile 4, 3, 2 and 1 patients respectively). Based on National Health Survey statistics for 1995 (ABS, 1998b), the proportion of top quintile 75+ year olds with PHI *in the full NSW population* was similar (85 per cent).<sup>7</sup> This indicates that for the 70+ top EFI group it can be assumed that the proportion of the NSW population with PHI that used hospitals in a given year is similar to the proportion of those with PHI amongst the hospitalised.

By examining the above statistics on private health insurance and the data underpinning Figure 1, we found that higher levels of PHI coverage amongst top EFI 70+ year old private hospital patients could only explain a relatively small part of the high hospital usage by that group. Use of same day surgery facilities for diagnostic purposes and the greater presence of these facilities in high socioeconomic regions is another possible explanation that could be explored in future using the NSW hospitals databases.

Appendix B presents charts similar to Figure 1, but for men and women separately. There are two major differences between the hospital utilisation patterns of the sexes. First, women in the major child bearing age group – 20 to 39 – use hospitals much more than men, with the majority using public hospitals. Second, in the 0-19 and 60+ age groups women use hospitals less than men. Another observation is that the patterns of socioeconomic gradients are similar for both sexes - generally downward sloping for patients in public hospitals and upward sloping in private hospitals.

Table 2 quantifies the trends apparent in Figure 1. It shows that the poorest persons (ie those in the bottom EFI quintile) had a 21 per cent higher hospitalisation rate in 1996-97 than the richest persons (ie those in the top EFI quintile). It also shows that for men in the bottom quintile the hospitalisation rate was 29 per cent higher than for the top quintile, compared with only 12 per cent higher for women. The difference between bottom and top EFI quintile was much more pronounced for public hospital patients (51 per cent). For private hospital patients it occurred in the opposite direction – with patients in the bottom EFI quintile having a 19 per cent lower hospitalisation rate than patients in the top quintile.

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<sup>7</sup> The National Health Survey quintiles were based on gross family income.

**Table 2 Differences in NSW hospitalisation rates across socioeconomic groupings and hospital type, 1996-97**

	Low income		High income		Ratio of mean rates	
	Mean rate (1)	SE (mean)	Mean rate (2)	SE (mean)	Ratio * (1/2)	Percent change (100*(1/2-1))
	no.	no.	no.	no.	no.	%
<b>All hospitals</b>						
Males	0.186	0.0005	0.144	0.0004	1.29	29.1
Females	0.226	0.0005	0.202	0.0005	1.12	11.8
Persons	0.208	0.0004	0.171	0.0003	1.21	21.2
<b>Public hospitals</b>						
Males	0.136	0.0005	0.084	0.0003	1.62	62.2
Females	0.160	0.0005	0.115	0.0004	1.39	38.7
Persons	0.149	0.0003	0.099	0.0003	1.51	51.0
<b>Private hospitals</b>						
Males	0.050	0.0003	0.061	0.0003	0.83	-16.8
Females	0.066	0.0003	0.087	0.0004	0.76	-23.9
Persons	0.059	0.0002	0.073	0.0002	0.81	-19.2

\* All ratios of mean rates were significant at  $p < 0.001$  (See Appendix A).

Note: 'Low income' group is the poorest 20% of the population (EFI Q1) and 'High income' is the richest 20% of the population (EFI Q5). SE is the standard error of the rate ratio: Q1/Q5.

When considering differences in hospitalisation rates across SES quintiles the issue of whether the findings are purely due to the age composition of the various quintiles arises (Thurecht et al 2003c, pp 19 and 20). While in publications on income distribution it is standard practice to present results at the level of SES quintiles without considering age effects ABS (2001, p.12), we present age specific hospitalisation rates in Table 3 so that the impact of the within quintile age compositions can be assessed.

Table 3 shows that differences in hospitalisation rates by SES exist within each age group. The greatest differences are in the 20-39 age group, with the poorest patients in that group having a 13 per cent higher hospitalisation rate than the richest patients. The differences are smaller for the 0-19 and 40-59 age groups and appear to be reversed for those aged 60 years or over.

In the context of this reversal it is worth noting that, amongst the retired, socio-economic status (as indicated by cash incomes) becomes considerably less clear than amongst people of working age. It is generally known that most older Australians

are 'cash poor',<sup>8</sup> but that some are also 'asset rich'.<sup>9</sup> Because assets – unlike income – are not accounted for in the SES measures generally used in the literature (such as EFI), even older patients who have considerable assets are likely to be classified into the lower SES quintiles. Consequently, once people retire the EFI measure is less reliable as an indicator of socio-economic status.

**Table 3: Differences in age specific hospitalisation rates across socioeconomic groupings, 1996-97**

	Low income		High income		Ratio of mean rates	
	Mean rate (1)	SE (mean)	Mean rate (2)	SE (mean)	Ratio * (1/2)	Percent change (100*(1/2-1))
	no.	no.	no.	no.	no.	%
<b>Age groups</b>						
0-19	0.146	0.0005	0.136	0.0007	1.07	7.4
20-39	0.174	0.0007	0.154	0.0005	1.13	13.1
40-59	0.172	0.0008	0.167	0.0006	1.03	3.0
60-69	0.265	0.0013	0.299	0.0020	0.89	-11.4
70+	0.423	0.0012	0.544	0.0028	0.78	-22.2

\* All ratios of mean rates were significant at  $p < 0.001$  (See Appendix A).

Note: 'Low income' group is the poorest 20% of the population (EFI Q1) and 'High income' is the richest 20% of the population (EFI Q5). SE is the standard error of the rate ratio: Q1/Q5.

### 3.2 Changes in the size and age composition of the NSW population, 1996-97 and 2000-01

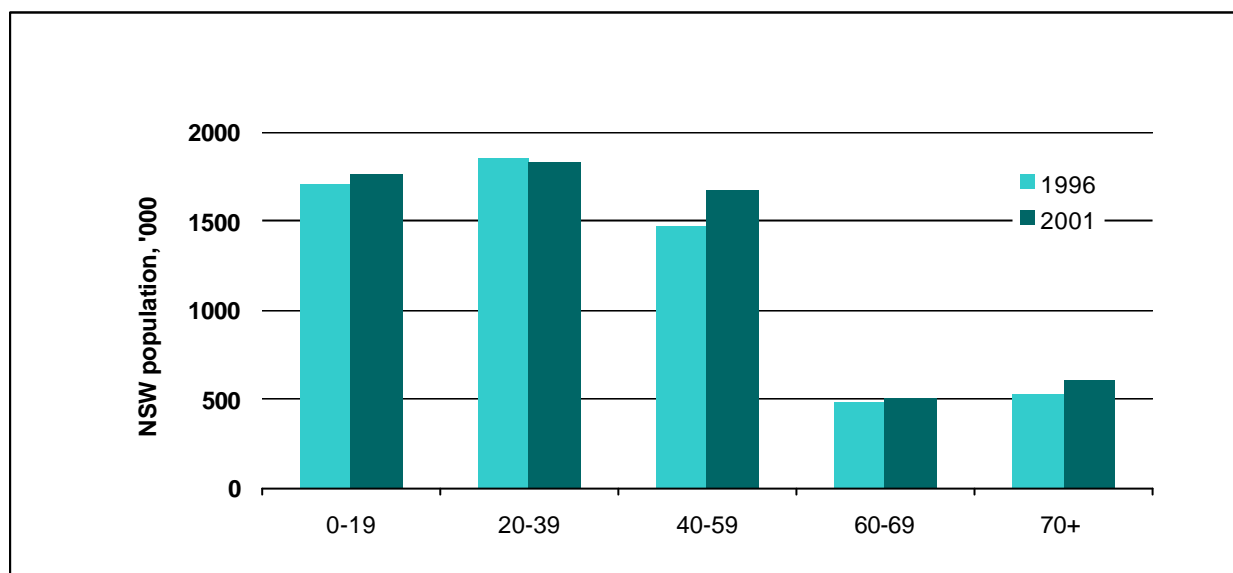
Considerable changes took place between the 1996 and 2001 Censuses (Figure 2). First, the population of NSW increased by 5.5 per cent. Second, the biggest increases occurred in the populations of 40-59 year olds – the 'baby boomers' – and those aged 70 years and over (13% and 14% respectively). Disaggregating the 70+ age group, the

<sup>8</sup> For example Kelly (2003) found that, in 2001, 82% of Australians aged 65 and over had an income of less than \$400 per week.

<sup>9</sup> This is particularly so for those who own a home in the capital city of NSW, Sydney, where house prices have become the highest in Australia – Kelly (2002).

Census data indicates a growth of 28 per cent in the number of those aged 85-89, and 39 per cent for those aged 90 years or more.

Figure 2: **Changes in the age distribution of the NSW population, 1996 and 2001** ('000)



Sources: Census data (1996 and 2001)

Third, considerably smaller increases occurred amongst 0-19 and 60-69 year olds (3% and 4% respectively). Finally, the population of the younger 'working aged' - 20-39 year olds - actually declined.

These changes are the early signs of the much discussed patterns expected to arise from population ageing - that is a considerable expansion of the 'retired' group and a significant decline in the proportion of the population in the 'working-age' group.

### 3.3 Trends in hospital use per capita, 1996-97 and 2000-01

The number of separations in NSW non-psychiatric hospitals (by NSW residents) increased from 1.76 million in 1996-97 to 1.95 million in 2000-01 - that is by 11 per cent. This is above the 5.5 per cent increase in the population over the same period (Section 3.2.1). To assess the extent to which hospital utilisation increased more rapidly than the growth in the population, we conducted some preliminary analyses. We computed hospitalisation rates (ie the number of separations divided by the

relevant NSW population).<sup>10</sup> Had hospital separations increased in line with the growth in the population, then there would have been no change in separations as a proportion of the population - ie separations per capita. In reality we found that, between 1996-97 and 2000-01, the age standardised per capita separations increased by 3.7 per cent overall (Table 4). This means that hospital separations by NSW residents increased by 3.7 per cent more than the size of the population

While the risk of hospitalisation increased by around 2 per cent for the 0-39 and 60-69 age groups, it actually declined for the 40-59 group (1.1%). A striking result is that it was very much higher for the 70+ group (10.9 %). While it is beyond the scope of this paper to investigate the reasons for this latter finding, a likely contributor is the 'ageing' of the 70+ group. With 28 and 39 per cent increases in the numbers of 85-89 and 90+ year olds respectively (Section 3.2.1), considerably higher rates of hospitalisation are expected than previously. This is because hospitalisation rates and health costs have been shown to be particularly high in the 1-2 years prior to death - see for example Goss et al (1994).

Table 4 also shows several interesting patterns that underpin the 3.7 per cent increase in the overall age standardised per capita separations. These include the very strong growth in per capita separations in private hospitals over the period (20 per cent), and the actual decline in such separations in public hospitals (3 per cent). This decline means that the number of separations in NSW public hospitals increased more slowly than the NSW population.

For private hospitals per capita separations increased significantly in all age groups - from 12 per cent for 20-39 year olds, to 34 per cent for 70+ year olds. For public hospitals the most striking finding is the 10 per cent decline in the per capita separations of 40-59 year olds (the baby boomers). This decline occurred in a period when overall hospital use by this group changed little (-1%). Another important finding is that the 70+ age group was the only one for which an increase in per capita public hospital separations occurred (2%) As noted earlier, this pattern probably arises from the very rapid increases in the numbers of 85-89 and 90+ persons in the NSW population.

As always, with analyses of such complex data systems there will be limitations. Compared with many other studies, we were fortunate to have access to large, full population datasets - and thus not being affected by limitations arising from use of survey data or the constraints placed on the extent of disaggregation due to small populations. However, some issues remain, an important one being the limitation common to analyses based on separations. This is because in separation-based analyses the nature of the casemix may have changed over time for particular

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<sup>10</sup> Once the 2000-01 hospitals dataset becomes available on a per patient basis, it will be possible to use a more appropriate definition of the hospitalisation rate: that is number of patients divided by the relevant population.

groups. Also, for the public system there has been a reclassification of same day patients previously classified as inpatient to non-inpatient status. This has occurred across the board but is most evident for procedures such as chemotherapy, the endoscopes and colonoscopies. Clarification of rules for emergency department patients classified as inpatient has been another cause for change. Therefore analysis of separations by itself is quite misleading. In contrast, for private hospitals there are very strong incentives to classify as much activity as inpatient as is possible.

Private hospital admissions grew over this time. One reason for this was the preparedness of uninsured patients to pay for themselves (particularly where this involved a once off event). For example during the 1990s a very entrepreneurial same day surgery sector emerged, which focussed on providing diagnostic services - mainly scopes - often to people who were self insured. Another reason related to changes in arrangements for veterans, who were able to access private hospitals more easily than in previous periods. Changes in the supply of private hospital services are also important to note. There were significant private sector developments, sometimes in areas that were not well supplied by private hospitals. In some cases these developments expanded the scope of services offered by the private sector, picking up demand for more complex services from private hospitals that existed but could not be met in previous times.

Figure 3 charts the above findings. It illustrates the increases in per capita separations between 1996-97 and 2000-01 and shows that the changes were mainly driven by the 70+ age group and the greater use of private hospitals.

### **3.4 Technological change and costs of hospitalisation, 1996-97 and 2000-01**

Rising health costs, especially in the hospital sector, have been of concern in most developed countries (Section 1.1). Based on AIHW (2003) statistics,<sup>11</sup> NSW hospital costs increased by 21 per cent in current prices (or 18 per cent in constant 2001 prices) - Table 5. Increases in the size of the NSW population are one explanatory factor and growth in the number of separations per capita another (Sections 3.2.1 and 3.2.2). The remaining aspects of the increase are likely to be due to higher treatment costs per separation and shifts from inpatient to non-inpatient services.

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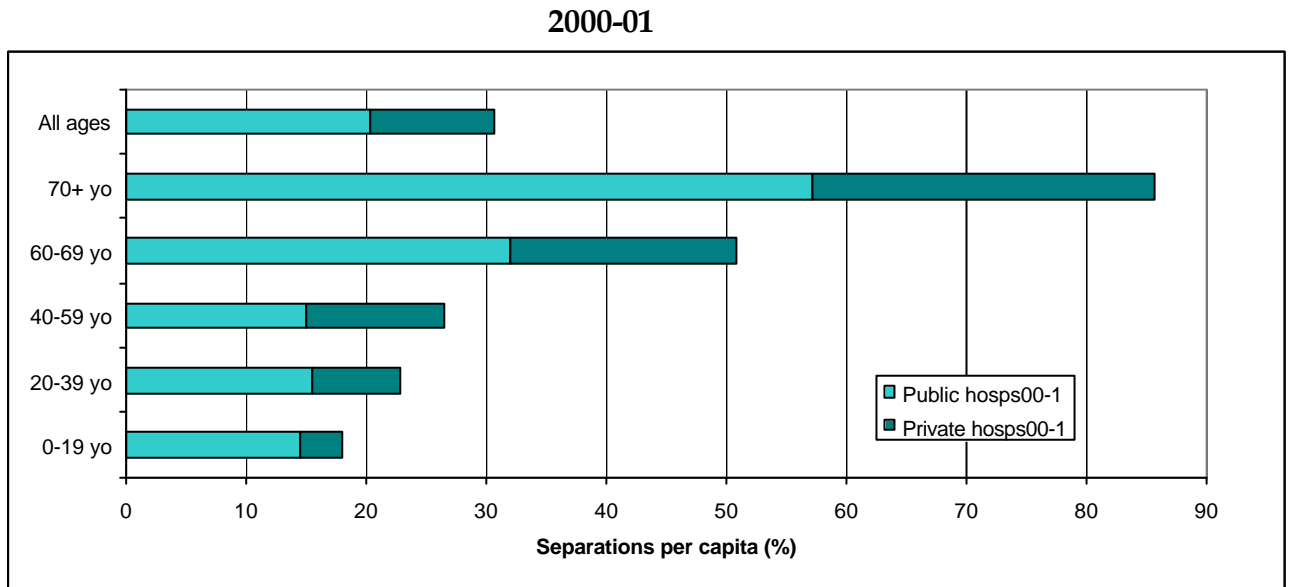
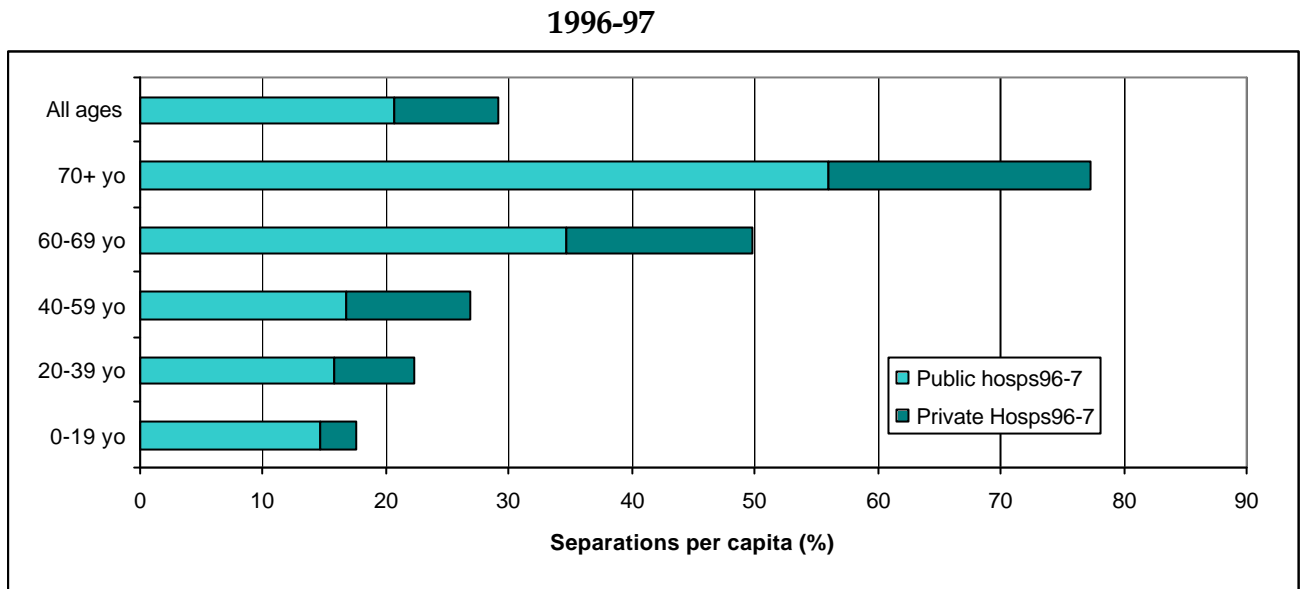
<sup>11</sup> Comparable with our hospitals datasets, but including some additional groups. The AIHW expenditure estimates are comparable, because they are for public hospitals (excluding psychiatric hospitals) and for private hospitals in NSW. The AIHW expenditure figures however include outpatients and interstate patients as well.

Table 4 Change in hospital separations per capita\*, 1996-97 and 2000-01

	Public hospitals			Private hospitals			All hospitals		
	1996-97	2000-01	Change	1996-97	2000-01	Change	1996-97	2000-01	Change
	rate	rate	%	rate	rate	%	rate	rate	%
<b>Age groups</b>									
0-19	0.146	0.144	-1.0	0.300	0.360	19.7	0.176	0.181	2.5
20-39	0.157	0.155	-1.4	0.660	0.740	12.0	0.224	0.229	2.6
40-59	0.168	0.151	-10.2	0.100	0.114	13.9	0.268	0.265	-1.1
60-69	0.347	0.321	-7.6	0.151	0.188	24.4	0.498	0.508	2.0
70+	0.559	0.572	2.2	0.213	0.285	33.9	0.773	0.857	10.9
<b>All ages**</b>	0.210	0.203	-3.1	0.860	0.103	20.2	0.296	0.306	3.7

\* Per number of persons in the age-specific NSW population. \*\* Age standardised to the 2001 NSW population using the above five age groups.

Figure 3: NSW hospital separations per capita,\* 1996-97 and 2000-01 (per cent)



\* Per number of persons in the relevant age-specific NSW population.

Sources: enhanced NSW hospitals time series data and Census data (1996 and 2001)

Table 5 **Government versus private funding of NSW hospital expenditures, 1996-97 and 2000-01** (current prices, \$million)

	Public hospitals* *			Private hospitals			ALL hospitals	
	Govern'ts	HIFs,* ind's, Other	Total	C'wealth Govern't	HIFs,* indi's, Others	Total		
	\$m	\$m	\$mi	\$m	\$m	\$m	\$m	\$m
1996-97	3966	474	4440	95	892	987		5427
2000-01	5029	383	5412	461	693	1154		6566
<b>Change</b>								
Current prices (%)	27	-19	22	385	-22	17		21
Constant prices (%)**	23	-21	18	372	-24	14		18

\*\* non-psychiatric \* HIF: Health Insurance Fund \*\*\* CPI, health, adjusted (8 capital city average) - ABS (2003b).

Source: AIHW (2003, pp 83 and 85)

Possible reasons for rises in treatment costs include a change in the casemix of patients treated, for example towards a higher proportion of patients needing more complex and costly treatment - such as the increasing numbers of frail aged (Section 3.2.1 and 3.2.2) ; the emergence and diffusion of newer, but more expensive medical technologies and techniques and higher hospital labour and operating costs.. Technology change is often seen as being the major driver of health cost increases in developed countries - OECD (2003a and b). Within the period under investigation expansion of coronary angioplasty was quite pronounced, but in addition the use of stents for the procedure became commonplace.

Table 5 also shows that the increases in expenditures between 1996-97 and 2000-01 were considerably greater for public hospitals than for private hospitals (22% compared with 17%); and that the Commonwealth government's contributions towards private hospital expenditures increased more than four-fold over the study period. This was in great part due to the introduction of the 30% PHI rebate. As a consequence, there was a decline of around 20 per cent in the contribution of individuals and Health Funds and other organisations. While in 1996-97 around 90 per cent of private hospital costs were financed by individuals (mainly through PHI an other membership fees), by 2000-01 that share declined to 60 per cent.

## 4 Summary of Findings

Analyses using 1996-97 data - comprising non-psychiatric hospitals in NSW and excluding interstate patients - have shown that the poor use public hospitals more than the rich. For example, patients in the poorest EFI quintile had a 21 per cent higher hospitalisation rate in 1996-97 than patients in the richest quintile.

However for private hospitals this pattern was reversed, with patients in the poorest EFI quintile having a 19 per cent lower hospitalisation rate than patients in the richest quintile. This 'reversed pattern' was especially pronounced for private hospital patients aged 70 years or more. An important finding was that, although a greater proportion of high SES patients used private hospitals, use of such hospitals was widespread across all SES quintiles. Considering all hospitals, usage was greater by people in the lower SES quintiles than in the higher ones.

Comparing the NSW population across 1996-97 and 2000-01, we found that there was a considerable increase in the numbers of the 'retired' and a significant decline in the size of the working-age population. Thus, in the five years to 2000-01, there were already signs of the much discussed changes in the patterns expected in the next couple of decades from population ageing. As a result, the findings we report on in this paper are likely to be magnified several fold in next couple of decades when, Australia-wide, some 4 million 'baby boomers'<sup>12</sup> are projected to augment the 2 million people who are currently retired.

While between 1996-97 and 2000-01 the population of NSW increased by 5.5 per cent, per capita separations grew by 3.7 per cent. Had separations grown at the same rate as the population, there would have been no change in per capita separations between 1996-97 and 2000-01. Thus the 3.7 per cent increase in per capita separations indicates that hospital utilisation increased more rapidly than the population. Increases in hospital usage were particularly pronounced in the 70+ age group and mainly concerned private hospitals. We found that per capita private hospital separations increased by 20 per cent over the period. Reasons for this include the growth of the 'self insured', changes in the arrangements for veterans and extensions in the scope of services offered by the private sector.

While in 1996-97 private hospital costs were mainly met by individuals through health insurance and/or direct payments (90%), by 2000-01 only 60% of such costs

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<sup>12</sup> The 'baby boomers' are generally defined persons born between 1946 and 1961.

were met by individuals due to considerable increases in government subsidies over the period (mainly through introduction of the 30% rebate).

## A Standard errors and statistical significance

In this study the standard errors (SE) of the age standardised means of the hospitalisation ratios were computed for two independent subpopulations – ie ‘low income’ Australians (EFI quintile 1) and ‘high income’ Australians (EFI quintile 5). Statistical testing for significance was carried out through a z-test (assuming a normal distribution), where:

$$z = \frac{\text{Ratio of the two means}}{\text{Standard error of the Ratio}}$$

The two independent subpopulations or groups are.

group 1 = quintile 1

group 2 = quintiles 5.

Denote the means of the groups by  $\bar{X}_1$  and  $\bar{X}_2$  and the standard errors of the two group means by  $SE(\bar{X}_1)$  and  $SE(\bar{X}_2)$ . The ratio of the two means is:

$$R = \bar{X}_1 / \bar{X}_2$$

To carry out a z-test of equality of the two subpopulation means, that is  $R=1$ , we calculated:

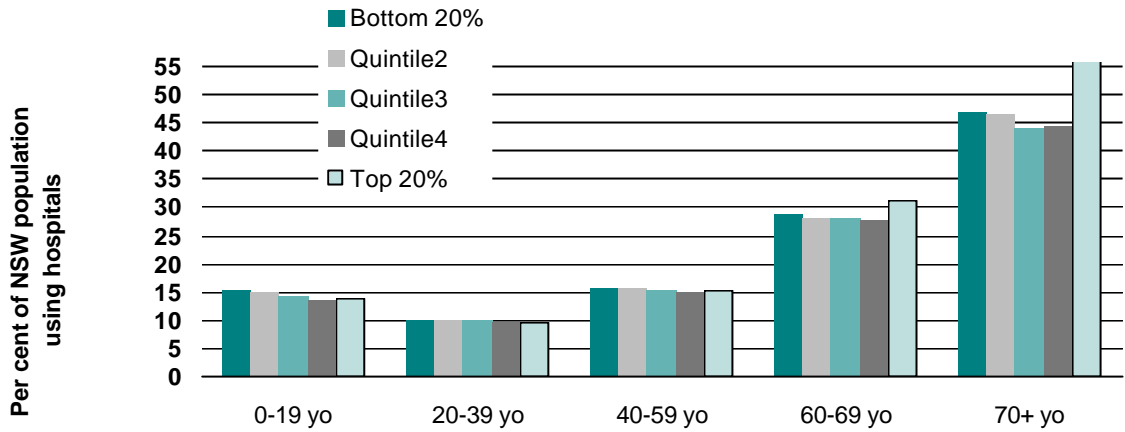
$$z = \frac{(R - 1)}{\sqrt{(SE_1^2(\bar{X}_1) + R^2 * SE_2^2(\bar{X}_2)) / \bar{X}_2^2}}$$

As a large sample approximation, this expression is distributed as  $z$ , the standard normal variable – see Cochran 1977. To obtain the means and the standard errors we used the *proc means* command of the SAS language.

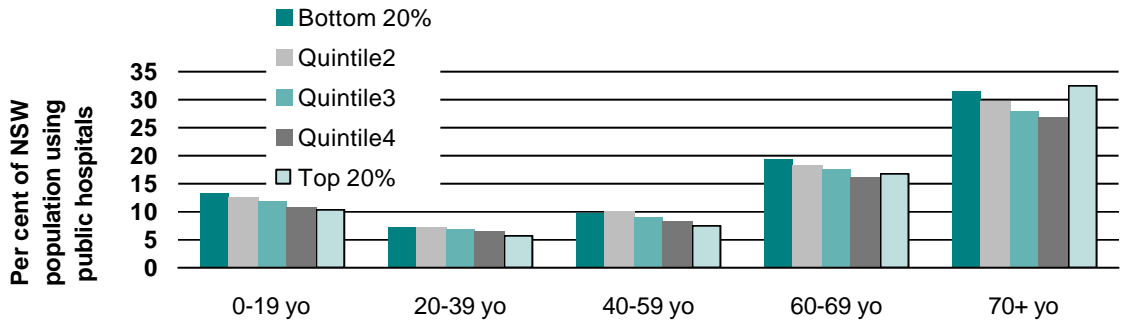
## B Hospitalisation rates by sex, 1996-97

Figure B.1: Proportion of males using NSW hospitals, by age and imputed equivalent family income quintile. 1996-97

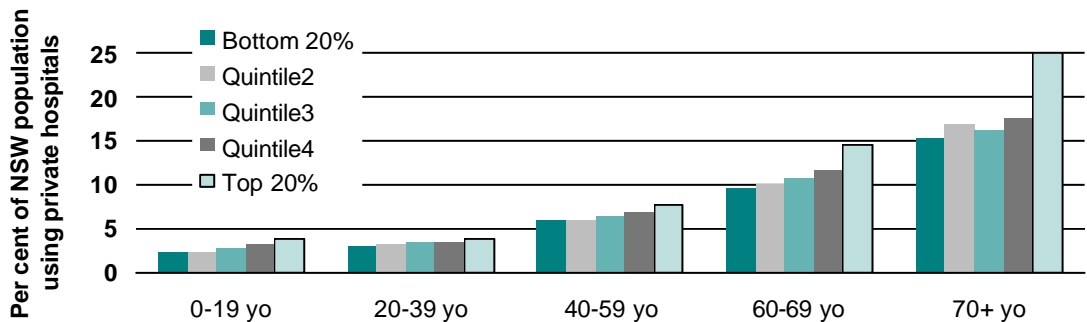
*Public and private hospitals*



*Public hospitals only*



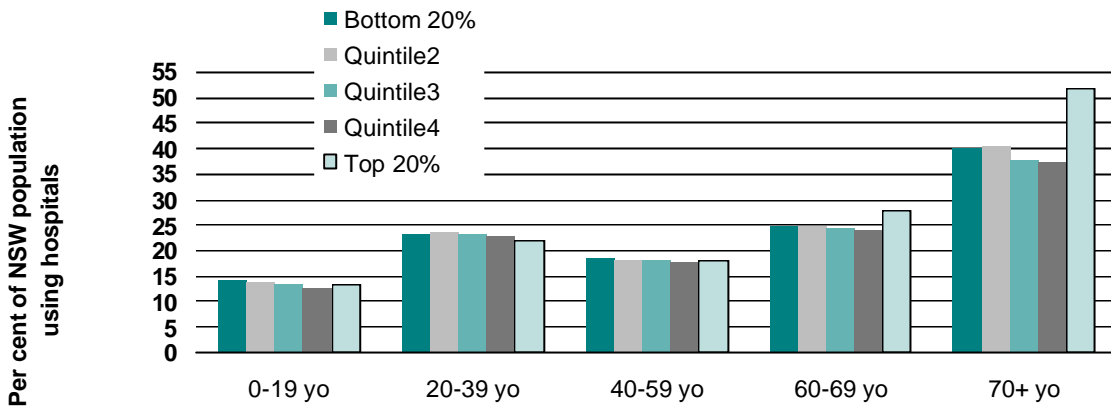
*Private hospitals only*



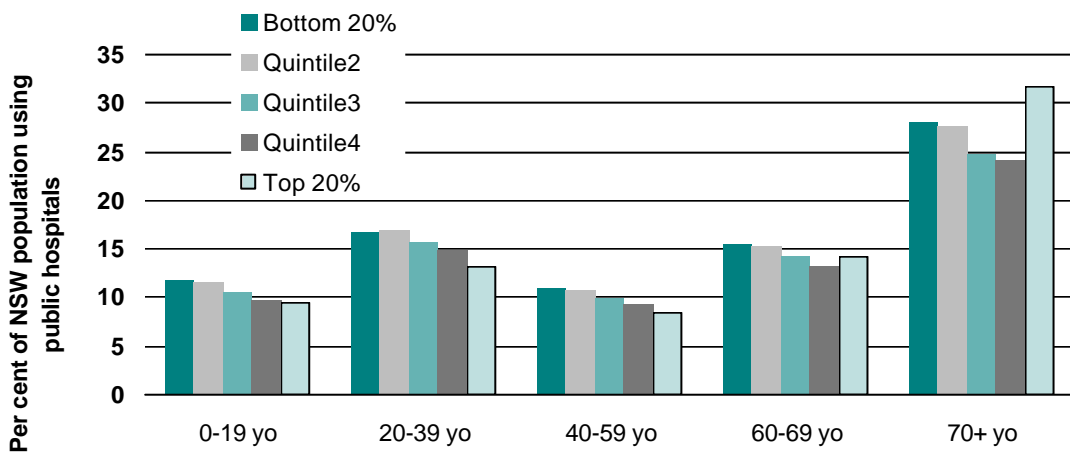
Sources: NSW hospitals and 1996 Census data. NOTE: because some patients had separations in both public and private hospitals in 1996-97, the 'public only' and 'private only' charts contain some double counting of patients (around 5 per cent).

Figure B.2: **Proportion of females using NSW hospitals, by age and imputed equivalent family income quintile. 1996-97**

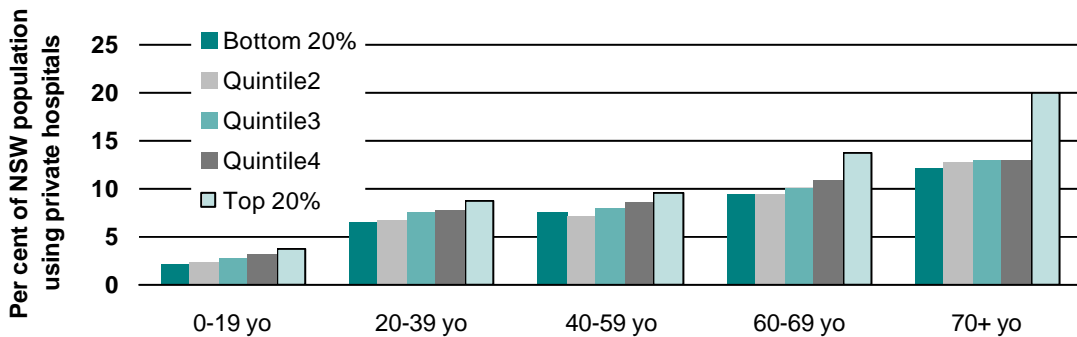
*Public and private hospitals*



*Public hospitals only*



*Private hospitals only*



Sources: NSW hospitals and 1996 Census data. NOTE: because some patients had separations in both public and private hospitals in 1996-97, the 'public only' and 'private only' charts contain some double counting of patients (around 5 per cent).

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