

Differentials in hospital admission rates for the Aboriginal and Torres Strait Islander population in New South Wales

MAGED ISHAK

Maged Ishak is a Lecturer in the Department of Statistics at the University of Newcastle.

Abstract

The indigenous Australian population is well known to have higher rates of morbidity and mortality than the rest of the Australian population. The study reported in this paper demonstrates the use of hospital admission data from New South Wales to monitor the health circumstances and the main areas of differentials of the indigenous population in relation to access to primary health care services. The study covers the period from 1989 to 1995. In providing a statistical approach to analysing large routine databases, the major results have been to provide estimates of the hospital admission rates by residential area, sex and age of patient, and to highlight the main differences.

Introduction

Indigenous Australians (referred to in this article as ATSI – Aboriginal and Torres Strait Islander peoples) are known to be disadvantaged in comparison with the rest of the Australian population (non-ATSI) in relation to their health and general socioeconomic conditions. The ATSI population has higher rates of morbidity and mortality, lives in more impoverished circumstances and has access

to poorer health services and facilities than most of the non-ATSI population. As the Federal Minister for Aboriginal Affairs acknowledged in September 1990, ATSI continue to suffer from health problems that would not be tolerated in the wider community. Their health problems vary across the country, reflecting different circumstances, but the overall standard of health is low everywhere (Horton 1994).

The primary objective of this study was to use the available data set of admissions to public and private hospitals to monitor the main areas of differentials between the ATSI and the non-ATSI populations in terms of hospital admissions and to provide indications of the special health circumstances of the ATSI population. The study covers the state of New South Wales for the period from 1989 to 1995. The hospital admission data for acute public and private hospitals in New South Wales have been used for this purpose.

The results of the study would help in the following ways.

1. Update the national input on the issue 'Aboriginal health and its differentials from the rest of the Australian population'. This would provide a guide for projects that aimed at planning and improving the primary health services, in particular, those concerning the ATSI population.
2. Update the available information regarding the specific disease groups that are more likely to affect the ATSI population, and hence result in a higher ATSI admission rate, so that the health authorities can effectively plan services in these areas.
3. Provide useful input to the hospital resource allocation model in such a way that the relative density of the ATSI population in a specific residential area, and hence the possibly related higher demand of a particular medical or surgical treatment, would be accounted for as a variable in that model.

Data sources

Two main sources of data are used in the analysis:

1. Hospital inpatient statistics collection (Department of Health)

These data are originally maintained through the Department of Health and worked out by the New South Wales Health Services Research Group at the University of Newcastle. The latter is the source of the data used in this study.

The data applied here are the total admissions to acute public and private hospitals in New South Wales for the years 1989–1990 to 1994–1995. These are classified by:

- ATSI/non-ATSI
- age group
- male/female
- service related group (SRG) – groups of admissions served by the same specialist
- Local Governmental Area.

2. Census population data (Australian Bureau of Statistics):

The population data of the 1991 census in Australia are used. These data correspond to the period covered in the study (1989–1995) in the sense that they represent the mid-point of this period, and hence would allow accurate estimation of the hospital admission rates for that time. Data are classified by age group, male/female, Local Government Area and ATSI/non-ATSI. It is worth noting here that the underestimation problem that usually affects the reported indigenous figures would have minimum effect on the estimates in this study. In fact, both the population figures and the hospital admission figures suffer the same problem in the same direction so, regarding the formula used, the calculated rates would be minimally affected.

Variables and method of analysis

The analysis is mainly carried out for the following two groups separately:

- Aboriginal and Torres Strait Islander peoples (ATSI)
- the rest of the Australian population (non-ATSI)

Three variables have been selected which are believed to focus on the basic areas of differences between the ATSI and the non-ATSI populations. These variables are:

- gender
- age group
- Local Government Area.

The measurement to be applied in the study is the *average annual admission rate to acute public and private hospitals per 1000 population*. This is given as

$$\text{Admission rate} = \frac{\text{Number of admissions of the considered group}}{\text{Number of population at risk in that group}} \times 1000$$

The average annual admission rate for the period 1989 to 1995 in New South Wales is calculated by applying the above formula, in which the numerator is the average number of admissions per year (the total number of admissions for the six-year period divided by six).

Results

Admission rate by gender

The admission rate to acute public and private hospitals for the ATSI population was generally higher than for the non-ATSI population, as can be seen from Table 1. The rates shown in the table are the average annual admission rates during the period 1989 to 1995. While the rate was 247.65 per thousand for the non-ATSI population, it was 295.10 per thousand for the ATSI population, which is 119 per cent of the non-ATSI rate. The higher rate for the ATSI population can be observed for both males and females, with the ATSI rate approximately 119 per cent of the non-ATSI rate for both genders. This pattern can be seen in Table 1 and Figure 1.

On the other hand, the female admission rate was generally higher than the male rate. For both the ATSI and the non-ATSI populations, the female rate was approximately 125 per cent of the male rate.

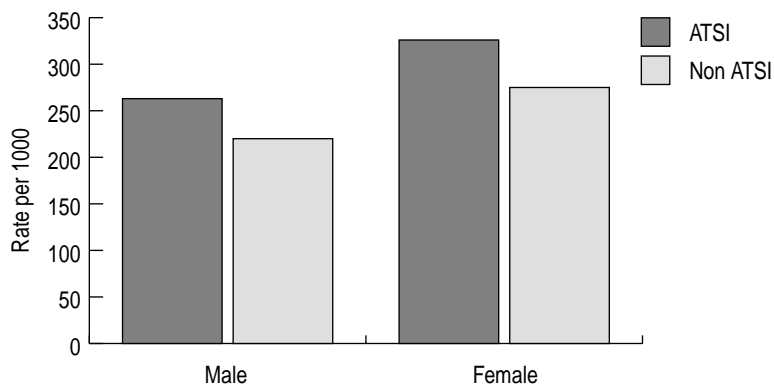


Figure 1: Annual admission rate (per 1000 population), NSW, average 1989–1995

Table 1: Annual admission rate (per 1000 population) by gender, NSW, average 1989–1995

	ATSI	Non-ATSI	Total	ATSI/Non-ATSI (%)
Male	263	220	221	119.72
Female	326	275	275	118.67
Total	295	248	248	119.16

Standardised rates

A more precise and real picture of the ATSI/non-ATSI differentials can be obtained by applying one of the age standardisation methods (Pollard et al. 1990). These aim to offset the effect of the age composition variations between the ATSI and non-ATSI populations. In fact, it is very important that these procedures be applied here, since the age composition of the ATSI population shows a very similar pattern to that of developing countries (younger age composition), while the age composition of the non-ATSI population presents a similar pattern to the one noted in developed countries (older age composition). Tables 2 and 3 present the standardised admission rate by applying the direct and indirect methods of standardisation respectively. Adopting the non-ATSI age composition, the direct method of standardisation gives an estimate of the ATSI admission rate of 410.98 per thousand population, a value which is more than one and a half the admission rate of the non-ATSI population. In fact, this value would express the real pattern of differentials between the ATSI and the non-ATSI populations in terms of admission rates to acute public and private hospital in New South Wales.

On the other hand, by applying the indirect method of standardisation, where the age-specific admission rates of the non-ATSI population are adopted, a similar estimate to the one from the direct standardisation method is obtained, with an ATSI admission rate of 381.12 per thousand population. When the standardised rates are applied, male/female differences show a similar pattern to the one discussed above, with a higher female admission rate than the male rate. Based on the direct standardisation method, the female rate is approximately 125 per cent of the male rate. Figures 2 and 3 summarise these results.

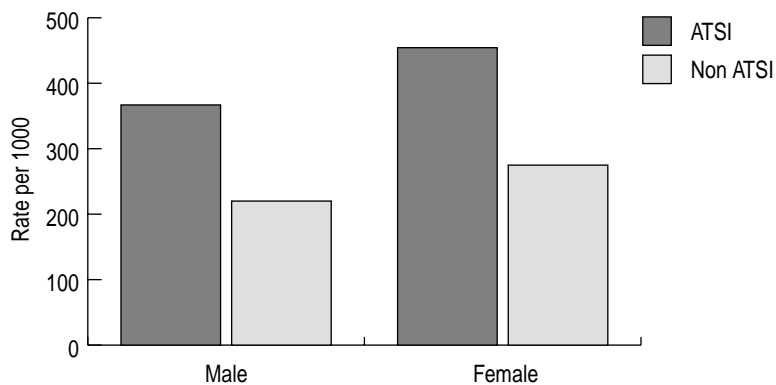


Figure 2: Direct standardised admission rate (per 1000 population), NSW, average 1989–1995

Table 2: Direct standardised admission rate (per 1000 population), NSW, average 1989–1995

	ATSI	Non-ATSI	Total	ATSI/Non-ATSI (%)
Male	366.85	220.01	220.62	166.74
Female	454.33	274.91	274.50	165.27
Total	410.98	247.65	247.76	165.95

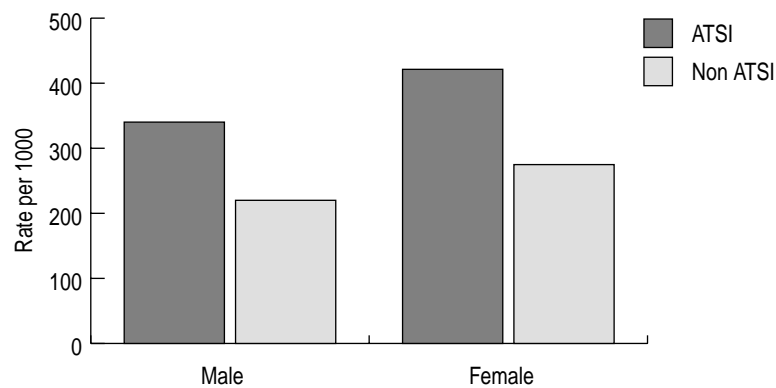


Figure 3: Indirect standardised admission rate (per 1000 population), NSW, average 1989–1995

Table 3: Indirect standardised admission rate (per 1000 population), NSW, average 1989–1995

	ATSI	Non-ATSI	Total	ATSI/Non-ATSI (%)
Male	340.20	220.01	264.75	154.63
Female	421.32	274.91	329.41	153.26
Total	381.12	247.65	297.32	153.90

Standard error of the estimates

Tables 4 and 5 show the standard error of the estimates for the admission rates and the standardised admission rates respectively. This is calculated using the formula

$$\text{Standard error of the admission rate} = \sqrt{\frac{\text{No of admissions}}{\text{Population}}}$$

The results show that the standard error of the ATSI admission rates is approximately 10 times those of the non-ATSI for both male and female populations. This can be regarded as an indication of the higher variation among the ATSI admission rates. However, the small size of the ATSI population also partially explains this high standard error. Nevertheless, the standard error of estimations decreased dramatically when the methods of standardisation were applied, as is shown in Table 5. This would be an additional justification to rely on the standardised estimates of the admission rate in our analysis.

Table 4: Standard error of the admission rate

	ATSI	Non-ATSI	Total	ATSI/Non-ATSI (%)
Male	0.0028	0.000285	0.0003	9.69
Female	0.0030	0.0003	0.0003	9.63
Total	0.0021	0.0002	0.0002	9.66

Table 5: Standard error of the standardised admission rate

	Rate for the ATSI population	
	Direct	Indirect
Male	0.000013	0.000275
Female	0.000016	0.000340
Total	0.000015	0.000308

Admission rate by age

The age distribution of the admission rates for both the ATSI and non-ATSI populations is presented in Table 6 and Figure 4. A higher rate of admission for the ATSI population can be noted in all age groups. The direction that can be noted is that the ATSI/non-ATSI percentage ratio (last column of Table 6) increases with age, with the admission rate of the ATSI population aged 45 and over approximately two times the admission rate of the non-ATSI population. This would indicate that the ATSI demand for health services is higher compared to the non-ATSI population, particularly for the older age groups of the ATSI population. This might be explained as a direct result of the general poorer socioeconomic status and the malnutrition-related problems of the ATSI population, which tend to seriously affect the health of individuals, in particular, the ageing. The above conclusion of the effect of the general poorer ATSI socioeconomic status on their health would be also emphasised through the relatively higher rate of ATSI admissions in the childhood period. This is one and a half times the non-ATSI rate.

Table 6: Annual admission rate (per 1000 population) by age group, NSW, average 1989–1995

Age group	ATSI	Non-ATSI	Total	ATSI/Non-ATSI (%)
0–4	350	235	236	149
5–9	96	89	88	109
10–14	77	76	75	102
15–19	212	132	133	161
20–24	298	203	204	146
25–29	337	240	240	140
30–34	311	234	234	133
35–39	335	203	204	165
40–44	338	188	189	179
45–49	483	233	234	208
50–54	523	272	273	192
55–59	644	316	318	204
60–64	688	370	371	186
65+	978	563	565	174
Total	294	248	248	119

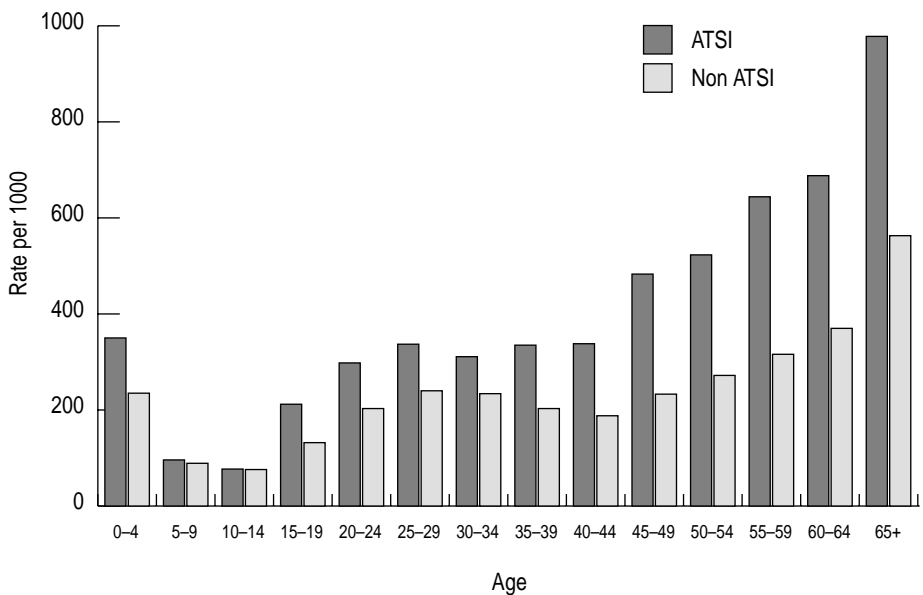


Figure 4: Annual admission rates (per 1000 population), NSW, average 1989-1995

Admission rate by area

Hospital admission rates for the ATSI and non-ATSI populations for the different Local Government Areas of New South Wales are presented in Table 7. The rates are sorted in descending order with respect to the ATSI estimates. The Local Government Areas with ATSI population less than 100 are added together in one group called ‘other’. The most apparent conclusions from this table are as follows.

1. The ATSI admission rate is dramatically high in some areas. For example, it is 1526 per thousand per annum in Richmond River. The next five highest areas, with admission rates of more than 1000, are Bourke, Brewarrina, Kyogle, Central Darling and Lachlan. The general direction that can be noticed from Table 7 is that the Local Government Areas in remote country areas tend to have higher ATSI admission rates than areas in major cities or close to large centres of the non-ATSI population.
2. The ATSI/non-ATSI differential in terms of admission rate is substantially high in some Local Government Areas. For example, in Richmond River the ATSI/non-ATSI ratio of the admission rate shows a very high value of 554 per cent, which indicates that in this area the ATSI admission rate is more than five times the non-ATSI rate. In Baulkham Hills the ATSI admission rate is approximately four times the non-ATSI rate.

3. The variation in the ATSI admission rates for the various Local Government Areas is considerably higher than the variation in the non-ATSI rates. While the standard deviation for the ATSI rates in the different Local Government Areas is 289.9, it is only 92.8 for the non-ATSI population. A similar result can also be obtained by applying the coefficient of variation measurement. This gives a value of 0.93 for the ATSI population and 0.30 for the non-ATSI population. These results indicate that the variation in the ATSI rates for the different Local Government Areas is more than three times the variation in the non-ATSI rates. In fact, various socioeconomic and health factors can well justify this pattern of the high variation in the non-ATSI admission rates for the different areas. This would encourage more extensive research into the reasons behind such a pattern of greater variation between Local Government Areas in regard to ATSI hospital admissions.

A correlation between the density of the ATSI population, defined as the number of the ATSI population living in a certain area over the number of the non-ATSI population living in that area, and the hospital admission rate has been calculated, as it is thought that the ATSI density would provide a meaningful explanation for the variation of the ATSI rates between the different Local Government Areas. The calculated coefficient of correlation was 0.53 (leading to not rejecting the null hypothesis $H_0: \rho = 0$), indicating no significant association between the ATSI density and the higher rate of hospital admission. This conclusion is also emphasised through the scatterplot of the ATSI admission rate versus the ATSI population density for all the Local Government Areas. This is presented in Figure 5.

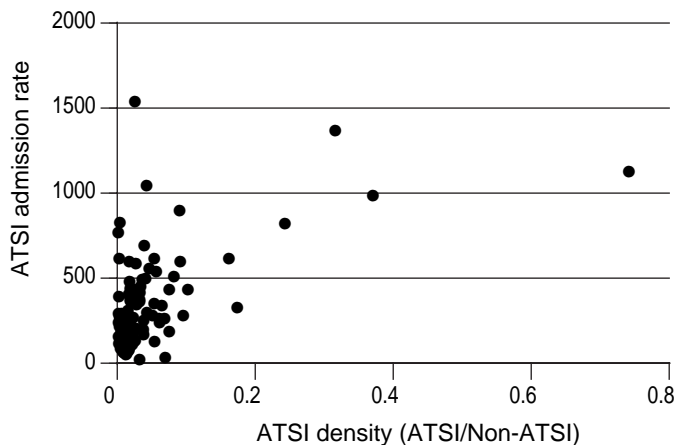


Figure 5: ATSI admission rate versus ATSI density

Finally, future work regarding more detailed analysis of the ATSI/non-ATSI differentials would be extremely useful. This would include analysing the admission data with respect to service related groups of diseases, procedure (medical/surgical), length of stay and type of hospital (public/private).

Table 7: Annual admission rate (per 1000 population) by Local Government Area, NSW, average 1989–1995

Local Government Area	ATSI*	Non-ATSI	Total	ATSI/Non-ATSI (%)	ATSI population
Richmond River	1526	276	302	554	222
Bourke	1351	403	609	335	1034
Brewarrina	1111	357	670	312	944
Kyogle	1029	303	326	339	388
Central Darling	971	246	414	395	805
Lachlan	882	347	384	255	623
Ashfield	809	236	235	342	160
Walgett	807	289	373	279	1513
Baulkham Hills	754	187	188	403	195
Casino	676	400	404	169	400
Coonamble	601	370	395	162	697
Narrabri	601	326	332	184	720
Sutherland	597	227	237	262	548
Ballina	581	252	253	231	501
Wellington	579	327	342	177	747
Inverell	568	255	257	223	401
Quirindi	540	315	325	171	229
Kempsey	521	251	260	207	1317
Gilgandra	496	300	308	165	371
Armidale	482	211	217	229	834
Nambucca	478	243	245	197	567
Ullmarra	465	214	214	217	100
Cowra	434	313	311	139	382
Lismore	421	220	219	191	749
Guyra	418	315	316	133	324
Warren	417	334	332	125	321
Grafton	415	307	304	135	391
Eurobodalla	399	256	254	156	842
Sydney(south)	388	315	292	123	1112
Hurstville	376	255	257	147	177
Parkes	360	381	369	94	425
Glen Innes	353	371	359	95	136
Broken Hill	353	200	196	177	459
Taree	351	298	292	118	795
Deniliquin	349	390	377	90	145
Copmanhurst	348	157	161	221	119
Orange	342	282	274	121	649
Bogan	333	340	329	98	168
Macleay	332	263	260	126	373
Coonabarabran	322	305	301	105	424
Moree Plains	313	238	238	131	2374
Bega Valley	295	217	214	136	401
Walcha	284	281	276	101	143
Gosford	277	245	282	113	778
Hornsby	275	221	220	125	267

continued

Table 7: Annual admission rate (per 1000 population) by Local Government Area, NSW, average 1989–1995 *continued*

Local Government Area	ATSI*	Non-ATSI	Total	ATSI/Non-ATSI (%)	ATSI population
Tenterfield	265	224	222	118	313
Narromine	262	310	306	85	567
Rockdale	260	249	251	105	278
Burwood	255	233	230	109	127
Shoalhaven	250	271	274	92	1524
Gunnedah	245	330	317	74	739
Narrandera	243	378	360	64	446
Bellingen	237	274	268	87	150
Balranald	235	110	113	212	109
Bland	232	254	250	91	104
Canterbury	231	233	231	99	472
Dubbo	224	229	224	98	1882
Ryde	224	223	223	100	196
Muswellbrook	219	266	258	83	270
Wagga Wagga	211	210	208	100	969
Marrickville	206	240	237	86	816
Other (ATSI population less than 100)	199	243	239	82	2670
Forbes	193	356	342	54	179
Griffith	185	283	276	65	547
Newcastle	183	262	258	70	1182
Tamworth	180	282	274	64	1241
Coffs Harbour	173	217	213	80	947
Parramatta	172	217	213	79	768
Great Lakes	171	325	314	53	392
Yass	169	110	109	154	108
Cobar	168	288	272	59	368
Leichhardt	156	250	242	62	563
Carrathool	152	271	261	56	117
Bathurst	152	292	283	52	492
Albury	152	235	224	65	483
Mudgee	151	329	317	46	118
Bankstown	150	252	251	60	796
Leeton	147	271	265	54	239
Warringham	143	233	228	62	342
Hastings	136	277	271	49	431
Holroyd	134	234	229	57	478
Blacktown	125	248	241	50	3400
Wollongong	123	241	244	51	1401
Uralla	120	188	181	64	146
Queanbeyan	119	100	97	119	504
Singleton	117	350	343	33	173
Auburn	110	244	242	45	283
Murrumbidgee	109	295	282	37	113
Tumut	109	275	264	40	259
Hawkesbury	108	216	210	50	424
Waverley	101	271	269	37	149
Shellharbour	100	241	257	42	573
Parry	91	188	184	49	250
Blue Mountains	89	244	237	37	440
Maitland	87	248	244	35	501
Tweed	83	193	188	43	980

continued

Table 7: Annual admission rate (per 1000 population) by Local Government Area, NSW, average 1989–1995 *continued*

Local Government Area	ATSI*	Non-ATSI	Total	ATSI/Non-ATSI (%)	ATSI population
Byron	82	219	213	37	212
Wingecarribee	81	256	253	32	198
Fairfield	81	209	207	39	1054
Lithgow	81	306	290	26	219
Penrith	77	215	209	36	1745
Camden	73	254	256	29	106
Lake Macquarie	72	239	237	30	1722
Cootamundra	64	296	283	22	130
Scone	64	289	279	22	135
Campbelltown	59	221	227	27	2153
Randwick	56	237	254	23	1098
Port Stephens	54	247	242	22	612
Wollondilly	54	212	211	26	246
Botany	53	241	260	22	352
Goulburn	49	234	226	21	196
Wyong	47	252	290	19	977
Liverpool	41	238	234	17	1253
Cessnock	36	308	299	12	529
Wentworth	19	13	13	142	468
Murray	8	42	39	18	152

Acknowledgement

The author would like to acknowledge the support of the Health Services Research Group at the University of Newcastle who agreed to the release of their data on the admissions to acute public and private hospitals in New South Wales.

References

Australian Institute of Health and Welfare 1996, *Australia's Health 1996: The Fifth Biennial Report of the Australian Institute of Health and Welfare*, Australian Government Publishing Service, Canberra.

Bhatia K & Anderson P 1995, *An Overview of Aboriginal and Torres Strait Islander Health: Present Status and Future Trends*, Australian Government Publishing Service, Canberra.

Commonwealth Department of Health, Housing and Community Services and 3M Health Information Systems 1994, *Australian National Diagnosis Related Groups: Definitions Manual*, Version 1, Sydney.

Duncan RC, Knapp RG & Miller MC 1983, *Biostatistics for the Health Sciences*, 2nd edn, Wiley, New York, pp 85–115.

Ernest H 1992, *Aboriginal Health and History: Power and Prejudice in Remote Australia*, Cambridge University Press, New York, pp 91–125.

Fleiss JL 1981, *Statistical Methods for Rates and Proportions*, 2nd edn, Wiley, New York, pp 219–40.

Health Services Planning and Development Unit, Hunter Area Health Services 1994, *Aboriginal Health Services Strategic Plan 1995–1998*, Sydney.

Horton D 1994, *The Encyclopaedia of Aboriginal Australia*, Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra, pp 456–63.

Hunter E 1993, *Aboriginal and Torres Strait Islander Health and History: Power and Prejudice in Remote Australia*, Cambridge University Press, New York.

National Aboriginal Health Strategy Working Party 1989, *A National Aboriginal Health Strategy*, Australian Government Publishing Service, Canberra.

New South Wales Health Services Research Group 1993, *An Overview of Trends in Acute In-patient Services in NSW: Past, Present and Future*, Newcastle University, Newcastle.

New South Wales Health Services Research Group 1995, *The Major Diagnosis and Procedure Codes (ICD9-CM) within each AN-DRG*, Version 1, Newcastle University, Newcastle.

Pollard AH et al. 1990, *Demographic Techniques*, 3rd edn, AS Wilson, Sydney.

Sibbritt DW 1993, 'Trends and projections for day only admissions in NSW acute hospitals', *Clinical Review*, 13, pp 17–22.

Turner J 1995, 'Utilisation of hospital and rehabilitation services by Aboriginal and Torres Strait Islander peoples of the Shoalhaven district, New South Wales', *Aboriginal and Torres Strait Islander Health Information Bulletin*, 20, Australian Institute of Health and Welfare, Canberra, pp 55–7.