

Indigenous health: Patterns of variation in terms of disease categories

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Abstract

While many studies investigated the higher morbidity and mortality levels of indigenous Australians in the high-density indigenous areas in the Northern Territory, Western Australia and South Australia, few examined the situation in New South Wales, where more than 28% of the indigenous population lives. Admissions to acute public and private hospitals in New South Wales for 1989–1995 are used in the study reported here to examine indigenous health and its differential patterns by disease categories. The study allowed for the monitoring of disease groups with particularly high indigenous admissions and, accordingly, pinpointed areas for improvement. Age-standardised estimates for the indigenous population are provided. Age composition of admissions for each disease category and admissions by residential area are also estimated.

Introduction

The higher morbidity and mortality levels of the indigenous Australians compared to the rest of the Australian population (non-indigenous) are well documented in the literature and have recently attracted increased attention (Ernest 1992; Horton 1994; Bhatia & Anderson 1995; Brooks 1995). Recently published studies conducted in Western Australia (Gracey & Vernon 1995) and my own in New South Wales (NSW) (Ishak 1998) reveal that hospital admission data could be considered a rich source of information that can be used to provide valuable indicators for indigenous health. On the other hand, while more than 28% of the indigenous population lives in NSW (1996 census figures – Australian Bureau of Statistics 1998), few studies have investigated their health status compared with the extensive coverage of this issue in the

high-density indigenous areas in the Northern Territory, Western Australia and South Australia.

This study aims to examine the NSW hospital admission data for 1989–1995 as classified according to disease categories (service related group or SRG, which is defined as group of admissions served by the same specialist). This allows for identifying disease groups with dramatically higher indigenous admission rates compared to non-indigenous rates and, hence, emphasises opportunities for improvement. By applying age standardisation techniques when estimating indigenous admission rates, the study provides more real and accurate figures of indigenous rates and indigenous/non-indigenous differentials for each SRG. The study also analyses the age composition of admission due to each SRG as well as differentials by residential areas.

Methods

Two types of data are used in the study: hospital admission data and population data. Admissions to acute public and private hospitals in NSW in the series of six years from 1989–1990 to 1994–1995 are examined here. The source of these data is the NSW Health Services Research Group at the University of Newcastle. The population data are from the 1991 census obtained from the Australian Bureau of Statistics. Special tabulation by age, sex, residential area (local government area) and indigenous/non-indigenous populations are prepared for the study.

The average annual admission rate to acute public and private hospitals in NSW per 1000 population for the six-year period 1989–1995 was calculated using the formula below.

$$\text{Admission Rate} = \frac{\text{Number of admissions of a particular SRG}}{\text{Number of population at risk in that SRG}} \times 1000$$

The advantage of using six-year averages is to minimise the effect of data inaccuracy that might substantially affect the result if a single year was used to estimate the indigenous rates (Fleiss 1981).

The Australian national diagnosis related groups are used here where disease categories are grouped into 34 SRGs (NSW Health Services Research Group 1995). These are listed in Table 1 where rates are calculated for each SRG for indigenous and non-indigenous populations separately. These are also calculated by gender, age group and residential area (local government area).

It is worth noting here that despite the well-known identification and underestimation problems affecting the quality of indigenous data, whether hospital admission or population figures, this will have minimal effect on the estimates obtained here using the above formula. Both the admission figures (numerator) and the population figures (denominator) suffer the same problem in the same direction for the same group of population, hence the estimated rates would be to a high degree unbiased towards either numerator or denominator (Australian Bureau of Statistics and Australian Institute of Health and Welfare 1997).

Direct and indirect methods of age standardisation (Pollard et al. 1990) are used when estimating the indigenous rates. The standardised rates offset the effect of age composition difference between indigenous and non-indigenous populations and allow for valid comparable indigenous figures.

T-test for the difference between two proportions ($P_1 - P_2$) is applied to test for the significance of the difference between indigenous and non-indigenous rates for each SRG.

Results

SRGs with highest indigenous admission rate

Table 1 presents the admission rates by SRGs and gender for indigenous and non-indigenous populations. The following can be concluded from the table.

- For both males and females, the highest difference between indigenous and non-indigenous populations is found in the admissions for Drugs & Alcohol, with the indigenous rate approximately eight times the non-indigenous rate for males and five times for females.
- Based on the percentage (Indigenous/non-indigenous %) for males, the top five SRGs that show significantly ($P < 0.01$) higher indigenous admission rates compared to the rest of Australians are Drugs & Alcohol, Burns (although the admission rates are too low for both populations), Endocrinology, Respiratory Medicine, Neurology and Dermatology. Figure 1 presents a comparative graph of the admission rates according to these five SRG in indigenous and non-indigenous populations.
- Based on the percentage (Indigenous/non-indigenous %) for females, the top five SRGs are Drugs & Alcohol, Endocrinology, Respiratory Medicine, Nephrology and Dermatology. These are similar to the leading SRGs for males except for Burns and Neurology. Figure 2 presents a comparative graph of the admission rates according to these five SRGs in indigenous and

non-indigenous populations. Accordingly, the five SRGs – Drugs & Alcohol, Endocrinology, Respiratory Medicine, Dermatology and Nephrology – are considered in more detail in the following sections. Generally speaking, the higher rates for these SRGs can be justified by the poorer social, environmental and hygienic pattern of life of the indigenous population. Dialysis, Neurology, General Medicine and Burns also show relatively higher indigenous admission rates, which are at least double the non-indigenous rates.

- SRGs such as Breast Surgery, Cardiothoracic and GIT Surgery that involve surgical procedures have generally lower indigenous admission rates than the non-indigenous rates. This would be regarded as an acceptable pattern resulting mainly from cultural differences and a typical indigenous negative attitude towards surgical procedures.
- Studying the SRGs with lower indigenous admission rates compared to the non-indigenous rates will enhance the understanding of the indigenous pattern of hospitalisation. Radiotherapy, Medical Oncology, Immunology, Rehabilitation and Vascular Surgery have shown the lowest indigenous admission rates compared to the non-indigenous rates. In fact, these SRGs are mainly associated with elderly patients and hence would raise a question about the hospitalisation pattern of the elderly indigenous population.

Table 1: Annual admission rate (per 1000 pop.) in NSW, average 1989–1995, by SRG

SRG	Indigenous		Non-indigenous		Indigenous / Non-indigenous %	
	Male	Female	Male	Female	Male ¹	Female
Drugs & Alcohol	14.44	4.60	1.81	0.86	796.43	532.29
Burns	0.17	0.04	0.04	0.02	411.04	215.32
Endocrinology	2.66	3.76	1.11	1.32	238.95	285.43
Respiratory Medicine	33.65	30.29	14.55	11.48	231.31	263.85
Neurology	14.61	8.57	6.44	6.42	226.92	133.58
Dermatology	3.34	2.71	1.50	1.21	222.11	223.09
General Medicine	28.49	34.08	15.03	15.81	189.53	215.59
Nephrology	2.01	3.62	1.18	1.45	170.01	248.66
Neonatology	2.51	2.00	1.56	1.29	160.32	155.23
Rheumatology	0.82	0.87	0.52	1.03	157.28	84.17

continued

Table 1: Annual admission rate (per 1000 pop.) in NSW, average 1989–1995, by SRG *continued*

SRG	Indigenous		Non-indigenous		Indigenous / Non-indigenous %	
	Male	Female	Male	Female	Male ¹	Female
ENT	13.93	12.51	10.25	7.98	135.85	156.74
Neurosurgery	5.63	3.15	4.41	2.90	127.74	108.50
Dialysis	15.53	26.22	12.42	12.95	124.97	202.53
Gastroenterology	25.32	26.90	21.58	24.59	117.33	109.41
General Surgery	34.23	27.08	30.88	26.59	110.85	101.85
Plastic Surgery	7.12	4.70	6.96	5.48	102.24	85.81
Dental Service	2.51	3.41	2.49	3.94	100.91	86.54
Mental Health	4.00	6.27	4.45	6.09	89.69	103.00
Orthopaedics	19.95	13.55	22.37	19.62	89.17	69.05
GIT Surgery	2.41	1.51	2.80	2.27	86.02	66.28
Cardiology	13.65	11.55	16.67	12.50	81.91	92.45
Ophthalmology	3.51	3.16	6.40	7.65	54.92	41.38
Haematology	1.92	1.71	3.71	3.52	51.70	48.58
Gynaecology	0.01	56.63	0.02	51.94	45.01	109.04
Cardiothoracic	0.97	0.35	2.17	0.95	44.68	36.52
Urology	6.51	2.27	14.96	4.26	43.49	53.24
Transplantation	0.01	0.01	0.03	0.02	35.18	72.13
Vascular Surgery	1.26	1.53	3.84	3.68	32.94	41.71
Rehabilitation	0.33	0.26	1.16	1.59	28.70	16.21
Immunology	0.28	0.12	1.26	0.17	22.15	70.76
Medical Oncology	1.62	1.56	7.33	6.82	22.07	22.87
Radiotherapy	0.01	0.06	0.08	0.11	18.09	53.55
Breast Surgery	0.00	0.50	0.02	0.93	0.00	54.41
Obstetrics	0.00	99.68	0.00	74.87	0.00	133.14

1. Ranked (in descending order) with respect to this column.

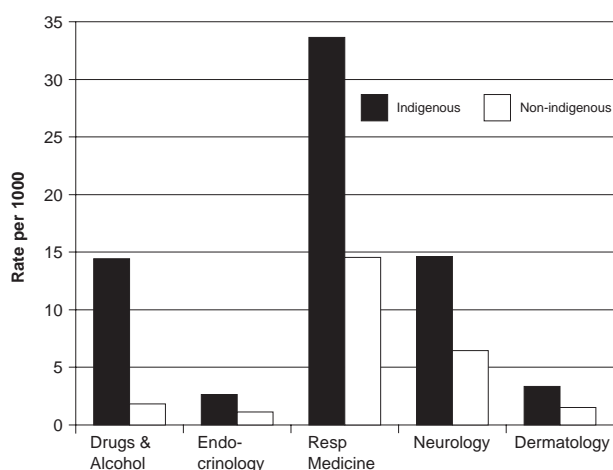


Figure 1: Annual admission rate in NSW, top five male SRG differentials, average 1989–1995

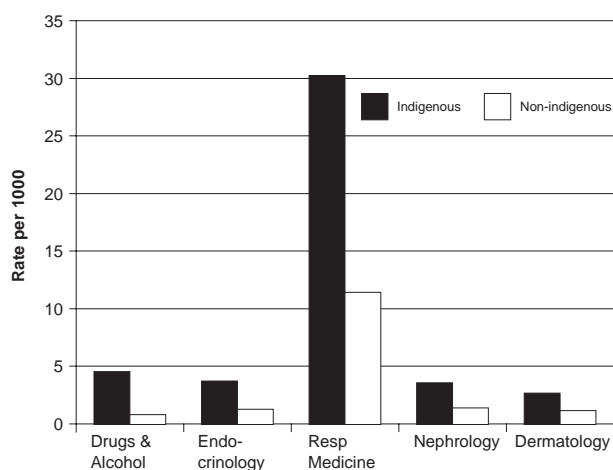


Figure 2: Annual admission rate in NSW, top five female SRG differentials, average 1989–1995

SRGs by age

The age pattern and the related indigenous/non-indigenous differentials are presented here for the five SRGs that showed the highest indigenous/non-indigenous differentials.

Respiratory Medicine

As shown in Table 2 and Figure 3, the indigenous admission rate due to Respiratory Medicine for children in the age category 0–4 years is approximately three times the rate for non-indigenous children. A decreasing trend can be noticed for the indigenous population where, by the age of 10 years, the indigenous rates reach a similar level to the non-indigenous rates. However, from the age of 30 years onwards the gap increases, with the indigenous admission rate for some age categories being approximately seven times the non-indigenous rate.

Table 2: Annual admission rates by SRG, Respiratory Medicine, NSW average 1989–1995

Age group	Indigenous	Non-indigenous
0–4	94.01	33.17
5–9	12.52	9.95
10–14	7.15	5.94
15–19	5.56	4.40
20–24	7.95	4.02
25–29	9.29	3.59
30–34	12.83	3.74
35–39	16.97	4.07
40–44	23.89	4.81
45–49	40.04	7.17
50–54	63.63	10.07
55–59	77.88	14.70
60–64	98.31	20.72
65+	153.89	41.85
All ages	31.91	13.00
Standardised rate	46.03	13.00

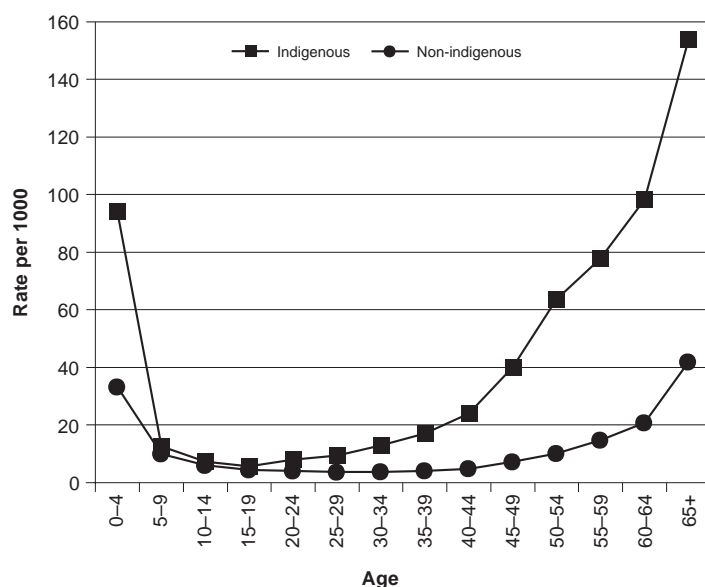


Figure 3: Annual admission rate by age, Respiratory Medicine, NSW average 1989–1995

Standardised rates

A more precise and real picture of the indigenous/non-indigenous differentials can be obtained by applying one of the age standardisation methods (Pollard et al. 1990). These methods aim to offset the effect of the age composition variations between the indigenous and non-indigenous populations. In fact, it is very important that these procedures be applied here, since the age composition of the indigenous population shows a substantially different pattern to the non-indigenous age composition. Thus, adopting the age-distribution of the non-indigenous population, the direct standardised rate for this SRG for the indigenous population is calculated to be 46.03 per thousand. Compared with the non-indigenous rate of 13 per thousand, we conclude that the indigenous admission rate for this SRG is approximately four times higher than the non-indigenous rate.

Drugs & Alcohol

Table 3 and Figure 4 show that while the admission rate for the non-indigenous population is fairly stable with age, the pattern for the indigenous population shows obvious age variations. Also, indigenous rates are much greater than the non-indigenous rate in most age categories. These rates are 15 times the non-indigenous rate in some age groups. The trend of indigenous admissions due to this diseases group reflects that the morbidity effect of drugs and alcohol among

the indigenous population starts early, by the age of 15 years, and increases with age. For the older ages (40 +) admissions for diseases related to drugs and alcohol seemed to overlap with the many other causes of admission that would occur in these ages. This would partially explain the decreasing pattern of the indigenous admission rates after the age of 40. The direct standardised rate for the indigenous population is calculated to be 13.08 per thousand, which is 10 times higher than the non-indigenous rate (1.33 per thousand).

Table 3: Annual admission rates by SRG, Drugs & Alcohol, NSW average 1989–1995

Age group	Indigenous	Non-indigenous
0–4	0.12	0.02
5–9	0.11	0.01
10–14	0.40	0.18
15–19	3.34	1.02
20–24	8.78	1.26
25–29	13.55	1.51
30–34	23.06	1.76
35–39	28.12	2.01
40–44	25.39	2.03
45–49	22.78	2.34
50–54	17.90	2.18
55–59	26.18	1.89
60–64	19.59	1.71
65+	7.04	1.42
Total	9.46	1.33
Standardised rate	13.08	

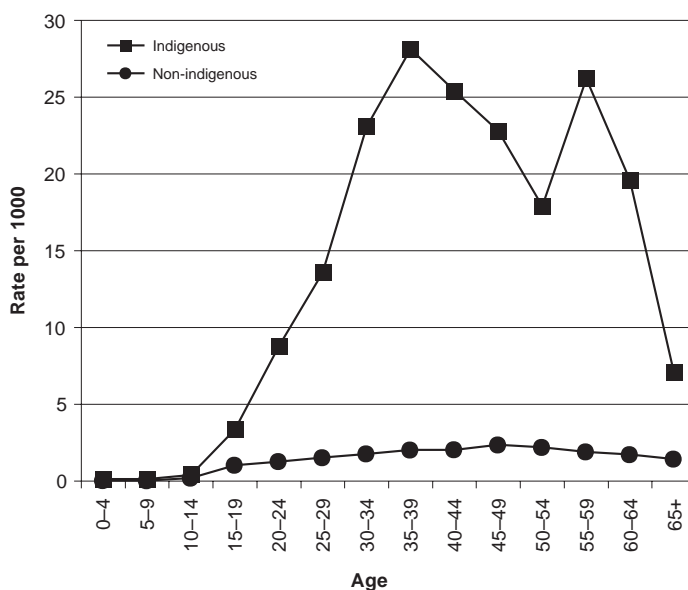


Figure 4: Annual admission rate by age, Drugs & Alcohol, NSW average 1989–1995

Endocrinology

Table 4 and Figure 5 show that while in the young ages (0–20 years old) minor differences can be noticed between the indigenous and the non-indigenous admission rates, the gap increases from the age of 20 years onwards. The indigenous rate is more than 10 times the non-indigenous rate in some age groups. This high rate of indigenous admission due to the Endocrinology group would be regarded as a clear indicator of the unhealthy environmental and nutrition habits under which the indigenous population lives. Nevertheless, medical causes related to the considerably higher indigenous rate of morbidity, in terms of hospital admissions, by the Endocrinology SRG need to be further investigated.

The direct standardised rate for that disease group amongst indigenous people has been calculated to be 6.63 per thousand, which is more than five times higher than the non-indigenous rate of 1.22 per thousand.

Table 4: Annual admission rates by SRG, Endocrinology, NSW average 1989–1995

Age group	Indigenous	Non-indigenous
0–4	0.30	0.55
5–9	0.31	0.59
10–14	0.17	0.86
15–19	0.51	0.66
20–24	1.52	0.51
25–29	2.19	0.53
30–34	2.84	0.56
35–39	4.84	0.59
40–44	7.45	0.72
45–49	13.01	1.02
50–54	13.22	1.36
55–59	16.31	1.76
60–64	17.40	2.24
65+	18.02	4.08
Total	3.21	1.22

Standardised rate	6.63
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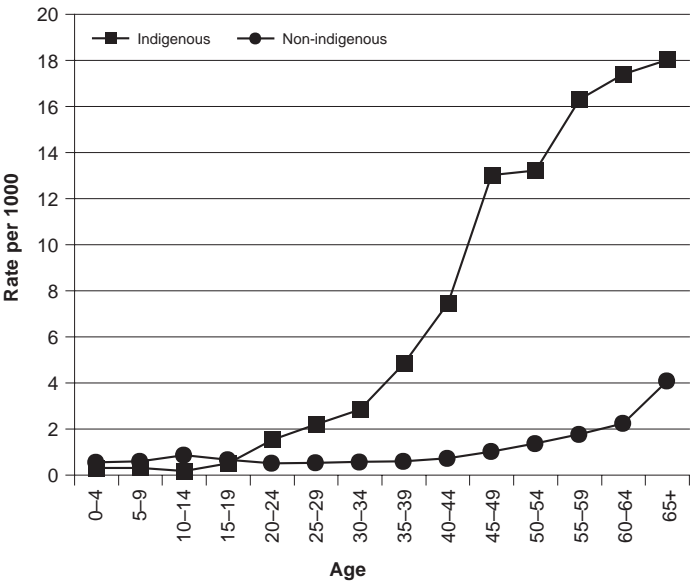


Figure 5: Annual admission rate by age, Endocrinology, NSW average 1989–1995

Dermatology

The admission rate due to the Dermatology SRG does not show a significant difference between the indigenous and non-indigenous populations in the middle age groups (between 10 and 60 years of age) as can be shown from Table 5 and Figure 6. However, it does show great variation in the childhood span and in the older ages (60 +). For some of these age spans, the indigenous rate is 10 times the non-indigenous rate. Roughly speaking, this group of diseases is, to a high degree, related to the general environmental conditions under which individuals live and, specifically, to personal hygiene. This might provide an explanation for the dramatically higher indigenous rates during childhood and in the older age groups.

The direct standardised admission rate for the indigenous population according to this SRG is calculated to be 3.06 per thousand, which is approximately two and a half times the non-indigenous rate (1.36 per thousand).

Table 5: Annual admission rates by SRG, Dermatology, NSW average 1989–1995

Age group	Indigenous	Non-indigenous
0–4	10.20	1.16
5–9	1.84	0.54
10–14	1.64	1.70
15–19	1.73	2.11
20–24	0.91	1.32
25–29	0.73	1.06
30–34	1.28	0.94
35–39	1.63	0.94
40–44	1.69	0.98
45–49	2.10	1.17
50–54	2.80	1.23
55–59	1.38	1.45
60–64	3.29	1.61
65+	8.07	2.31
Total	3.02	1.36
Standardised rate	3.06	

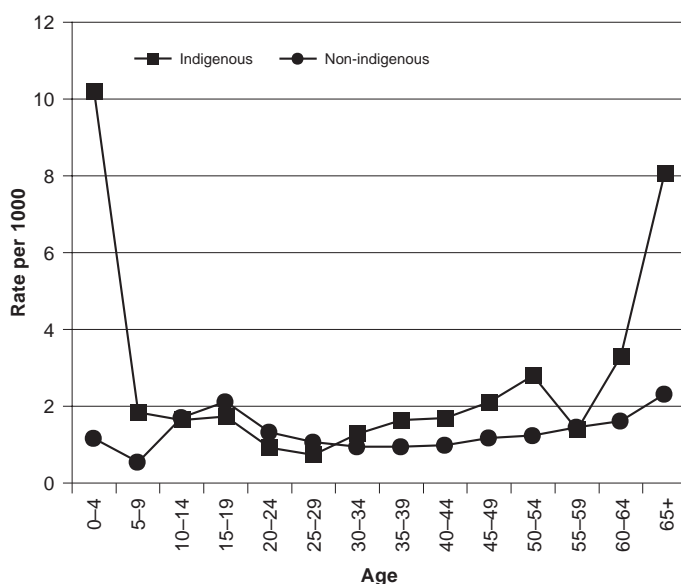


Figure 6: Annual admission rate by age, Dermatology, NSW average 1989–1995

Nephrology

Admission rates by age due to the Nephrology SRG are presented in Table 6 and Figure 7. It can be noted that during the younger age span (0–20 years of age) the indigenous rate of admission is similar to the non-indigenous rate. The rate of admission for the indigenous population increases more rapidly than the rate for the non-indigenous population after the age of 20 years. Indigenous rates are found to be more than 10 times the non-indigenous rates in some age groups of this period.

The direct standardised rate for the indigenous population has been calculated to be 6.16 per thousand, which is approximately five times the corresponding rate for the non-indigenous population (1.32 per thousand). Again, the higher indigenous rates for this group of diseases can be significantly associated with the general environmental conditions under which the population lives and also with personal hygiene.

Table 6: Annual admission rates by SRG, Nephrology, NSW average 1989–1995

Age group	Indigenous	Non-indigenous
0-4	0.58	0.21
5-9	0.71	0.23
10-14	0.30	0.19
15-19	0.61	0.29
20-24	0.59	0.37
25-29	1.59	0.38
30-34	2.39	0.46
35-39	3.89	0.53
40-44	7.58	0.70
45-49	7.22	1.35
50-54	10.66	1.70
55-59	13.05	2.02
60-64	17.86	3.11
65+	20.38	5.59
Total	2.82	1.32
Standardised rate	6.16	

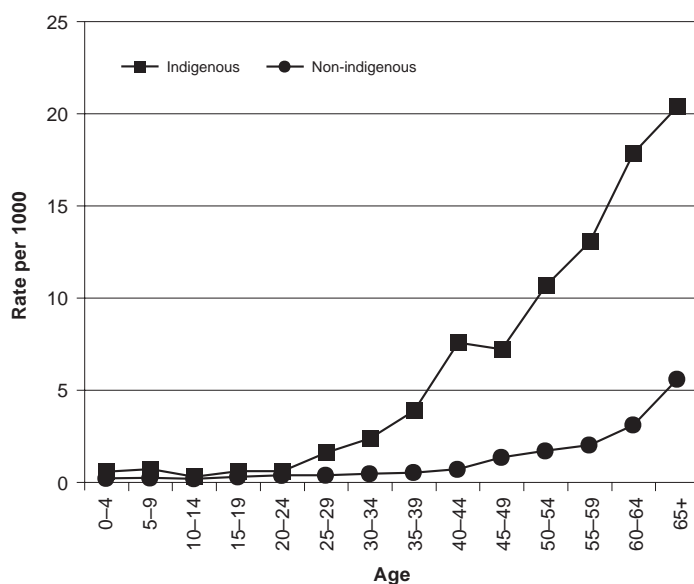


Figure 7: Annual admission rate by age, Nephrology, NSW average 1989–1995

SRGs by area of residence

Admission rates by SRG in 176 local government areas of NSW for both indigenous and non-indigenous populations have been estimated and examined. The main findings are as follows.

- Area of residence is an important factor that can explain a considerable portion of the variation in hospital admission rates between indigenous and non-indigenous populations. That is, particular local government areas are suffering substantially high indigenous admission rates regardless of the SRG. These particular local government areas, listed below, require investigation to understand the factors behind such high rates of indigenous admission.
- Local government areas in remote country areas generally experience a higher indigenous admission rate and a higher indigenous/non-indigenous differential compared to those in major cities or close to large centres of the non-indigenous population. This raises a question about the type and standard of medical care available to the indigenous population living in these areas and about their socio-economic conditions.
- For the five SRGs considered in this analysis, the local government areas that commonly show the highest indigenous admission rate includes **Kyogle, Richmond River, Brewarrina, Bourke, Lachlan, Central Darling and Walgett**. For the Respiratory Medicine SRG, for example, these local government areas have an indigenous rate that is approximately 10 times the rate for the non-indigenous population. Similar results are also found for the other SRGs.
- For all the SRGs considered in this analysis, higher indigenous rates are usually associated with higher indigenous/non-indigenous differentials. This suggests that the local government areas with high indigenous admission rates have an indigenous problem only and not a general problem for all the residents of these areas.

Discussion

Hospital admission data are a rich source of information that can provide efficient indicators on the prevalence of diseases and their differentials in the population. This study showed that the indigenous population experiences substantially higher rates of admission to hospitals, with more than 10 times the non-indigenous rates in some SRGs. The study pointed out these SRGs so that health authorities would be in a better position when planning for improving the health status of this sector of the population. Indeed, further investigation still needs to be carried out using the results of this study, with the aim of

analysing medical, social and cultural aspects behind the higher indigenous admission rates for these SRGs. A limitation of the current study is the use of admission data only from acute hospitals. Future work would also try to incorporate data from small and private health providers to enhance the current results and to obtain more comprehensive figures of indigenous admission rates and indigenous differentials by SRG.

The study revealed that significant variation effects were accounted for by the residential area. Particular local government areas are suffering substantially higher indigenous admission rates for all SRGs. These particular local government areas require intensive investigation to understand the factors that cause the high admission rates for indigenous people.

The identification problem that is likely affecting indigenous data is frequently pointed out in the literature. In this study we tried to eliminate the effect of this problem when estimating the indigenous figures. In fact, both the population figures and the hospital admission figures suffer the same problem in the same direction (refer to the formula used above), so the calculated rates are minimally affected. However, further work needs to be undertaken to assess the completeness of the indigenous data and provide adjusted and updated measurements for the indigenous figures.

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