RESEARCH REPORT

Estimating the magnitude of potentially avoidable hospitalisations of Indigenous children in the Australian Capital Territory: Some methodological challenges

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AIATSIS

Potentially avoidable hospitalisations (PAHs) are important indicators of health gains that can be achieved through provision of appropriate preventive care and early disease management (AIHW 2008; Li Shu et al. 2009), including for Indigenous Australian populations (Stamp et al. 1998). Australian Indigenous people have poorer health than non-Indigenous people, are less likely to utilise health services and more than twice as likely to be hospitalised (AIHW 2009). Little specific research attention has been given, however, to Indigenous children in hospital-based studies of Australian Indigenous peoples. Most studies focus either on the total Indigenous population, or compare Indigenous and non-Indigenous groups (Glasgow et al. 2003). Where studies including Indigenous children *have* occurred, they have examined outcomes in relation to vaccine-preventable conditions only (Burdon 1995) or explored experiences of remote Aboriginal families whose children were in an urban paediatric hospital (Tanner et al. 2005). No research attention has been given to the magnitude of potentially avoidable hospitalisations for children, including Australian Indigenous children.

The data described here were part of a doctoral study that explored the experiences of families of Indigenous children hospitalised in two public hospitals in the Australian Capital Territory (ACT) — The Canberra Hospital (TCH) and Calvary Hospital (Guthrie 2009). Ethical approvals for the study were obtained from three sources: Winnunga Nimmityjah (ACT's only community-controlled Aboriginal Health Service),[1] the Human Research Ethics Committee (HREC) of ACT Health and Community Care, and the HREC of The University of New South Wales.

An initial objective of the study was to obtain a definitive number of PAHs of Indigenous children in the ACT during the study period. The population of interest — all those Indigenous children aged five years and under who were hospitalised in the ACT from 2000 to 2005 for PAHs — would seem to be easily definable. However, because of some inherent data limitations an iterative methodological approach was required. Nonetheless, an estimate of the magnitude of PAHs for Indigenous children in the ACT during the period 2000 to 2005 has been derived.

Methodological approaches and issues

ACT Health hospital separation data

A dataset comprising all ACT hospital admissions and emergency presentations for Indigenous children less than five years of age during the period 2000 to 2005 inclusive was analysed. The under-reporting of Indigenous status in hospital separation data is well known (AIHW 2010). A 'capture-re-capture' process (Wittes and Sidel 1968) was used to mitigate the effects of that under-reporting in the dataset provided. It did this by using each Patient Record Number (PRN) that had been coded as Indigenous at least once, then matching and enumerating every other occasion of care for that PRN. There were two other elements of the data provided that could not be mitigated against: first, it was not possible to detect an Indigenous child who was *never* identified as such in the dataset; second, as there is no unique record number (URN) for patients attending either TCH or Calvary (ACT Health, pers. comm. (email correspondence received by J Guthrie), 21 December 2009), it was not possible to identify instances where an Indigenous child had been identified at one ACT hospital but not at the other and the same child would have two URNs (not one) if he or she had attended both hospitals.

There were six numeric values for denoting Indigenous status in the dataset (Table 1).

Table 1: Coding denoting Indigenous status

Code	Indigenous status
1	Aboriginal (not Torres Strait Islander)
2	Torres Strait Islander (not Aboriginal)
3	Both Aboriginal and Torres Strait Islander
4	Neither Aboriginal nor Torres Strait Islander
5	[No description given]
9	Unknown or inadequately described or not stated

The data recapture showed 335 occasions of care where an entry was coded as Indigenous at least once, but *not* coded as Indigenous on at least one *other* occasion. As seen in Table 2, the breakdown of the capture-recapture process showed that:

- for 263 occasions of care, the entry was coded as ‘1. Aboriginal (not Torres Strait Islander)’ on one occasion, but as ‘4. Neither Aboriginal nor Torres Strait Islander’ at other times
- for 34 occasions of care, the entry was coded as ‘2. Torres Strait Islander (not Aboriginal)’ on one occasion, but as ‘4. Neither Aboriginal nor Torres Strait Islander’ at other times
- for 30 occasions of care, the entry was coded as ‘3. Both Aboriginal and Torres Strait Islander’ on one occasion, but as ‘4. Neither Aboriginal nor Torres Strait Islander’ at other times
- for six occasions of care, the entry was coded as ‘1. Aboriginal (not Torres Strait Islander)’ on one occasion, but as ‘5. [No description given]’ at other times
- for two occasions of care, the entry was coded as ‘1. Aboriginal (not Torres Strait Islander)’ on one occasion, but as ‘9. Unknown or inadequately described or not stated’ at other times.

Nevertheless, 335 occasions of care were able to be assessed as incorrect in terms of Indigenous identification, indicating that a more accurate number of occasions of care — notwithstanding the inherent limitations of the study as previously discussed — was 2212.

International Classification of Diseases

International Classification of Diseases (ICD) coding has its origins in lists of causes of death, morbidity and hospitalisation. It is the international standard diagnostic classification for all general epidemiological and many health management purposes and includes the analysis of the general health situation of population groups and monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables such as the characteristics and circumstances of the individuals affected (WHO 2007).

Figure 1 shows the introduction of new editions of ICD coding in Australian usage. ‘ICD-AM’ coding refers to ICD coding specific to Australia (WHO 2007). ICD coding changed from version 9 to version 10 for four states in 1998 and for all states in 1999. Another anomaly within the dataset provided was that ACT Health used mixed ICD coding during the study period: discussions with ACT Health data management staff were not able to explain reasons for this mixed usage (ACT Health, pers. comm. (correspondence received by J Guthrie), 20 June 2006).

Jackson and Tobias (2001) categorised PAHs into preventable hospitalisations through population-based strategies, ambulatory-sensitive conditions and hospitalisations avoidable through injury prevention. No Australian studies have used their three-pronged approach to date. In New South Wales, Victoria and South Australia ambulatory-sensitive conditions only have been used (Jackson and Tobias 2001; NSW Department of Health 2004b; Page et al. 2007; Public Health Division and DHS 2001; Rural and Regional Health and Aged Care Services Division and DHS 2004).

Table 2: Capture-recapture results

		Unchecked Indigenous status code ('capture')						
		Coded as '1'	Coded as '2'	Coded as '3'	Coded as '4'	Coded as '5'	Coded as '9'	Totals
Checked Indigenous status code ('recapture')	Recaptured as code '1'	1700	2	11	263	6	2	1,984
	Recaptured as code '2'	1	33	2	34	0	0	70
	Recaptured as code '3'	13	2	113	30	0	0	158
Totals		1,714	37	126	327	6	2	2,212

Year	ICD version used in Australia
1994	ICD-9-CM US version
Australian modification developed in 1994	
1996	ICD-9-CM Second Edition
1997	ICD-9-CM Second Edition
1998	ICD-10-AM First Edition (4 states)
1999	ICD-10-AM First Edition (all states)
2000	ICD-10-AM Second Edition
2001	ICD-10-AM Second Edition
2002	ICD-10-AM Third Edition
2003	ICD-10-AM Third Edition
2004	ICD-10-AM Fourth Edition
2006	ICD-10-AM Fifth Edition

Figure 1: Chronology of ICD codes in use in Australia

The dataset was used to derive an estimate of the magnitude of PAHs. The current study extends methodologies from earlier Australian studies by incorporating two additional components from the Jackson and Tobias (2001) model; namely, preventable hospitalisations and injury (where these are applicable to children less than five years). However, the dataset had inherent limitations due to the sometimes haphazard application of ICD codes. A number of factors were therefore necessary in ascertaining an estimate of the PAHs. As an initial step, primary diagnoses for the 2212 occasions of care were mapped to ICD codes. A list of ICD codes for ambulatory care-sensitive conditions developed by Page et al. (2007) was then used to construct syntax using SPSS software (SPSS and 10th edition 2000), which was applied to the primary diagnoses. Because Page et al.'s list of ICD codes includes conditions that are not child-specific, an abridged list resulted. Furthermore, for influenza and pneumonia (listed under the broader heading of vaccine-preventable conditions), Page et al. (2007:57) indicate that for ICD codes J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.9, J16.8, J18.1 and J18.8, these should be 'excluded for people under 2 months'. For the purposes of this analysis, '2 months' has been approximated to 62 days (i.e.

2 x 31 days in each month). As a more conservative estimate, in applying this criterion all those children under the age of 70 days were filtered out.

Results

Frequency of occasions of care

The aforementioned 2212 entries represented 770 occasions of care per PRN, ranging from one to 30 occasions of care per PRN (Table 3). There were 308 (40%) occurrences with one occasions of care, and 462 (60%) occurrences with more than one occasion of care.

Table 3: Frequency of occasions of care per URN

Frequency	No. occasion of cares	%	Subtotals
308	1	40.0	308 (40%)
188	2	24.4	
86	3	11.2	
57	4	7.4	
26	5	3.4	
42	6	5.5	
19	7	2.5	
6	8	0.8	
15	9	1.9	
19	10–19	2.4	
3	20–29	0.1	
1	30	0.1	462 (60%)
770	**1**	**100.0**	**770 (100%)**

Primary diagnoses

For 88 entries, the primary diagnosis code entered was ‘Z53.1: “Procedure not carried out because of patient’s decision for reasons of belief or group pressure”’. In the absence of contextual information, these 88 entries were regarded as inadmissible for analysis and consequently removed, together with 273 other entries for which the primary diagnosis was missing — bringing the total of missing or inadmissible codes to 361.

Table 4 provides a summarised version of the ICD-9 and ICD-10 codes for the remaining 1851 entries, highlighting that ‘diseases of the respiratory system’ accounted for the majority of hospitalisations during the study period (n = 438, 22.4%), followed by ‘injury, poisoning and certain other consequences of external causes’ (n = 311, 15.9%), ‘symptoms, signs, abnormal clinical and laboratory findings’ (n = 285, 14.6%), ‘factors influencing health status and contact with health services’ (n = 138, 12.1%), and ‘certain infectious and parasitic conditions’ (n = 226, 11.5%).

Avoidable hospitalisations

SPSS syntax based on the ICD codes previously mentioned was applied. Table 5 shows that 372 (approximately 20%) entries were assessed as ‘not avoidable’ and 1479 – approximately 80% — were assessed as potentially ‘avoidable’.

Discussion

This study demonstrates that the rate of avoidable admissions in this population is quite high. Current medical record systems in the ACT have limitations because of the effects of (a) no genuine URN, (b) the application of ICD codes by ACT Health coders and (c) underreporting of Indigenous status — the capture-recapture process could not detect Indigenous children who were *never* identified as such, nor could it identify where a child had been identified as Indigenous at one hospital but not at the other, as these would appear as two different URNs. The methodology is unique, but important. It extends methodologies documented in earlier Australian studies for identifying potentially avoidable hospitalisations by incorporating two additional components from the Jackson and Tobias model; namely, preventable hospitalisations and injury, where these are applicable to children less than five years of age. No Australian studies have used the three-pronged approach to date: for example, in New South Wales and Victoria a list of only ambulatory-sensitive conditions has been used (DHS 2001, 2004; NSW Department of Health 2004a).

Using these methods, the estimated proportion of occasions of hospitalisations that were potentially avoidable for Indigenous children in the ACT was 80%. This high proportion, however,

Table 4: Summary of primary diagnoses counts mapped to ICD codes

Disease category	**Count**	**%**
Diseases of respiratory system	438	22.4
Injury, poisoning and certain other consequences of external causes	311	15.9
Symptoms, signs, abnormal clinical and laboratory findings	285	14.6
Factors influencing health status and contact with health services	138	12.1
Certain infectious and parasitic diseases	226	11.5
Certain conditions originating in perinatal period	84	4.3
Diseases of digestive system	72	3.5
External causes of morbidity and mortality	70	3.5
Diseases of nervous system	55	2.8
Diseases of skin and subcutaneous tissue	48	2.4
Diseases of ear and mastoid process	35	1.7
Diseases of genitourinary system	26	1.3
Congenital malformations, deformations and chromosomal abnormalities	26	1.3
Diseases of musculoskeletal system and connective tissue	20	1.0
Endocrine, nutritional and metabolic diseases	7	0.035
Diseases of eye and adnexa	6	0.03
Diseases of circulatory system/blood and blood forming	4	0.02
Totals	**1,851**	100
Missing primary diagnosis codes and probable miscodes	**361**	
	2,212	

Table 5: Estimated 'avoidable' and 'not avoidable' hospitalisations of Indigenous children in the ACT, 2000–05

	Count	**%**
Assessed as 'not avoidable'	372	20.09
Assessed as 'avoidable'	1,479	79.91
Totals	**1,851**	**100.0**
Missing primary diagnosis code or probable miscode	**361**	
	2,212	

should be interpreted with some caution, as all of the occasions of care (i.e. emergency and inpatient) were aggregated. Therefore, one condition requiring hospitalisation may have resulted in more than one occasion of care for a child: to illustrate, a child presenting at an emergency department for pneumonia may have been subsequently admitted to a hospital ward — this would be represented in the hospital separation data as two occasions of care, potentially exaggerating the proportion of avoidable hospitalisations. Nonetheless, the data indicates that preventive care and early intervention are lacking for Indigenous children.

Despite these limitations, it is reasonable to conclude that there is a need to ensure quality data collection for Indigenous populations, particularly children, so that primary care can be directed to potential antecedents in urban settings such as Canberra. While this study is able to highlight the undesirable situation regarding the frequency and high proportion of potentially avoidable hospitalisation for Indigenous children, it has not been able to explore the antecedents of the phenomenon. Further study needs to be undertaken to understand the underlying reasons for the high proportion of PAHs, both for Indigenous children in the ACT and for Indigenous children living in others parts of Australia, so that the primary health sector can respond more appropriately to the needs of Indigenous families.

NOTE

1. For information about the Winnunga Nimmityjah Aboriginal Health Service, see the organisation's website at <www.winnunga.org.au/>.

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Jill Guthrie is a descendant of the Wiradjuri people of western New South Wales, and has lived in Canberra for more than 20 years. Her PhD, conferred in December 2009 and undertaken through the School of Public Health and Community Medicine at The University of New South Wales, is titled 'A phenomenological exploration of the experiences of families of Indigenous children hospitalised in the Australian Capital Territory'. Jill is a graduate of the Master of Applied Epidemiology (MAE) Program at the National Centre for Epidemiology and Population Health (NCEPH) at The Australian National University (ANU). Following graduation from the MAE Program, Jill worked as an academic member of the MAE staff and continues to work in the MAE Program. In March 2009 she was appointed as a Research Fellow at AIATSIS. She has an adjunct appointment with ANU and is supervising Masters and PhD students enrolled at NCEPH, as well as being involved in other research projects. She is a member of the National Health and Medical Research Council-funded Indigenous Offender Health Research capacity building group.