Appendix A. Construction of utilisation rates using the 1995 National Health Survey

This appendix provides detailed definitions of each medical service and how the utilisation rates were calculated from the 1995 NHS. The question numbers refer to the numbering on the questionnaire as presented in the ABS *1995 National Health Survey Data Reference Pack*.

- **Hospital visits as an admitted patient:** Respondents were asked about visits to a hospital for their own health in the previous two weeks. Admitted hospital patients are those visiting a day clinic for minor surgery or diagnostic tests other than an x-ray, and hospitals other than as an outpatient or emergency patient. NHS Q508, Q509, Q510, Q511, Q512, Q513.
- **Hospital visits as a non-admitted patient:** Respondents were asked about visits to a hospital for their own health in the previous two weeks. Non-admitted hospital visits include: visits to the outpatients section of a hospital; and visits to a casualty or emergency ward of a hospital. NHS Q501, Q502, Q504, Q505, Q506.
- **Prescription medication:** Respondents were asked about medications they had used in the previous two weeks (vitamins and minerals are explicitly excluded). The respondent was then asked to get out the medications, and the names of all medications were then recorded. The respondent was then asked whether a prescription was needed to get each medication (up to a maximum of seven medications). If a prescription was needed then it was classified as a prescription medication. NHS Q605, Q606, Q608, Q614, Q625, Q636, Q647, Q658, Q669, Q680.
- **Non-prescription medication (see discussion for prescription medications):** Defined as a medication for which a prescription was not needed. NHS Q605, Q606, Q608, Q614, Q625, Q636, Q647, Q658, Q669, Q680.
- **Other health professionals**: includes acupuncturist, audiologist/audiometrist, chiropractor, chemist, chiropodist/podiatrist, dietician/nutritionist, herbalist, hypnotherapist, naturopath, nurse, optician/optometrist, osteopath, occupational therapist, physiotherapist/hydrotherapist, psychologist, social worker/welfare officer, speech therapist/pathologist, other. NHS Q520, Q521.
- **General practitioner and specialist:** excludes consultations during hospital and day clinic visits. NHS Q515, Q516.

Appendix B. Distribution of health expenditure by equivalent income

Table B.1 Per capita income, Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	777	505	256	16	8365
2	279	136	136	7	9147
3	230	128	99	3	9137
4	165	80	82	3	4173
5	87	40	46	1	1947

Table B.2 Per capita income, non-Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	9814	5009	4718	87	10 059
2	9752	4519	5136	97	10 315
3	10054	4496	5475	83	8922
4	9881	4335	5471	75	9280
5	10 128	4590	5485	53	5987

Table B.3 Henderson equivalence scale, Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	636	388	231	17	5516
2	408	247	154	7	9147
3	248	128	117	3	1964
4	149	71	76	2	4173
5	97	55	41	1	2060

Table B.4 Henderson equivalence scale, non-Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	8505	3836	4570	99	10 120
2	8595	4018	4498	79	10 315
3	9001	4186	4736	79	8922
4	9257	4341	4860	56	7182
5	9696	4223	5414	59	9280

Table B.5 New OECD equivalence scale, Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	658	406	235	17	5516
2	380	218	154	8	9147
3	256	145	110	1	1964
4	162	78	81	3	4173
5	82	42	39	1	1947

Table B.6 New OECD equivalence scale, non-Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	9476	4486	4888	102	10 120
2	9616	4494	5032	90	10 315
3	9957	4654	5225	78	8912
4	10 384	4676	5644	64	7923
5	10 196	4639	5496	61	9280

Table B.7 Raw family income, Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	446	249	187	10	9137
2	486	291	180	15	9147
3	309	178	129	2	1964
4	177	102	72	3	4173
5	120	69	51	0	419

Table B.8 Raw family income, non-Indigenous

Quintile	Number in sample	Number with zero health	Number with expenditure of $1–1000	Number with expenditure of more than $1000	Maximum health expenditure
1	9372	4546	4732	94	10 120
2	9466	4419	4959	88	10 315
3	9719	4490	5144	85	8922
4	10 113	4556	5498	59	7923
5	10 054	4520	5475	59	9280

Appendix C. Estimates of cost per medical service

This appendix presents the information on the average costs of medical services which is used in conjunction with the NHS 1995 to produce the estimates of per capita health expenditure. These estimates have been made using a variety of administrative and survey data sources by the AIHW. CAEPR has taken these estimates as given. CAEPR was provided with no information on the standard errors of these estimates or with enough information to allow the standard errors to be calculated.

Table C.1 Cost per day in hospital for admitted patients

	Male		Female	
	Non-Indigenous	Indigenous	Non-Indigenous	Indigenous
	$	$	$	$
Male				
0 to 4 years	743	732	724	708
5 to 9 years	892	791	900	786
10 to 14 years	861	783	831	757
15 to 19 years	764	719	710	577
20 to 24 years	627	560	683	567
25 to 29 years	624	580	675	591
30 to 34 years	631	576	683	584
35 to 39 years	693	611	702	633
40 to 44 years	714	693	695	620
45 to 49 years	692	484	688	665
50 to 54 years	733	565	701	616
55 to 59 years	755	658	699	613
60 to 64 years	720	567	707	594
65 to 69 years	733	588	685	473
70 to 74 years	690	558	661	544
75+ years	587	478	531	461
Total	678	621	640	607

Note: Acute patient costs for public and private hospitals are calculated using state DRG weights and are based on 1997–98 hospital data. Medical costs for private patients are not included. 1998–99 dollars. Expenditure is calculated using the Australian Refined (AR) system of diagnosis related groups (DRGs). Each AR-DRG represents a class of patients with similar clinical conditions requiring similar hospital services. Data were supplied to the AIHW by the state and territory health authorities, and by the Department of Veterans' Affairs for the hospitals it operated in NSW. Data were of two main types. The first, collated by AIHW as the National Public Hospital Establishments Database, included information about public hospitals, their resources, expenditure and revenue. The second type, collated as the National Hospital Morbidity Database, was patient-level data on the diagnoses and other characteristics of admitted patients in both public and private hospitals, and on the hospital care they received.

Table C.2 Out-of-hospital specialist services, cost per service, 1998–99

	Benefit paid ($)		Out of pocket expenditure ($)	
	Males	Females	Males	Females
Indigenous				
0–44	58	56	14	14
45+	51	51	11	11
Total	54	53	12	12
Non-Indigenous				
00–04	53	53	12	12
05–14	53	53	12	12
15–24	53	53	12	12
25–34	53	53	12	12
35–44	53	53	12	12
45–54	53	53	12	12
55–64	53	53	12	12
65–74	53	53	12	12
75+	53	53	12	12
Total	53	53	12	12

Note: Estimated using a combination of Medicare data and data from the Beach survey of general practitioners.

Table C.3 Out-of-hospital GP services, cost per service, 1998–99

	Benefit paid ($)		Out of pocket expenditure ($)	
	Males	Females	Males	Females
Indigenous				
00–04	75	62	7	6
05–14	32	30	3	3
15–24	26	60	2	5
25–34	49	87	4	9
35–44	54	83	5	9
45–54	85	94	10	12
55–64	85	147	8	13
65–74	123	144	6	6
75+	170	134	6	4
Total	50	68	5	7

Table C.3 Out-of-hospital GP services, cost per service, 1998–99 (continued)

	Benefit paid ($)		Out of pocket expenditure ($)	
	Males	Females	Males	Females
Non-Indigenous				
00–04	156	145	14	13
05–14	71	73	6	7
15–24	66	118	6	10
25–34	76	138	7	15
35–44	86	133	9	15
45–54	103	152	12	19
55–64	145	184	14	16
65–74	200	228	9	10
75+	216	314	7	9
Total	105	150	9	13

Note: Estimated using a combination of Medicare data and data from the Beach survey of general practitioners.

Table C.4 Prescription medications

	Benefit paid ($)		Out of pocket expenditure ($)	
	Males	Females	Males	Females
Males				
0–4	37.24	5.2	22.37	4.2
5–14	39.95	2.4	22.60	2.2
15–24	42.51	2.1	25.75	1.5
25–34	43.19	2.4	21.02	4.6
35–44	40.33	3.2	26.85	3.7
45–54	38.66	4.4	26.02	6.7
55–64	40.83	9.0	29.70	11.9
65–74	34.23	18.5	29.60	17.6
75+	21.48	27.1	27.87	10.1
Total	35.16	5.7	24.74	3.8

Table C.4 Prescription medications (continued)

	Benefit paid ($)		Out of pocket expenditure ($)	
	Males	Females	Males	Females
Females				
0–4	35.52	5.0	19.79	4.2
5–14	36.67	2.6	21.29	1.7
15–24	43.74	4.0	29.13	2.8
25–34	44.39	4.3	24.14	5.4
35–44	41.03	4.6	26.92	5.4
45–54	41.62	6.2	26.79	7.8
55–64	40.55	12.6	30.70	15.5
65–74	33.10	22.8	35.30	12.0
75+	26.58	27.9	25.99	15.9
Total	36.09	8.0	26.10	4.6

Note: Estimated using a combination of administrative data on prescription medications and data from the Beach survey of general practitioners.

It was not possible to disaggregate costs for all medical service types. The following estimates were only available on an Australian-wide basis:

- *Non-admitted patients in public non-psychiatric hospitals*: For this medical service type there is only an Australia-wide estimate. The average cost per non-admitted patient is $95.64.
- *Over-the-counter medications*: For this medical service type there is only an Australia-wide estimate. The average cost per over-the-counter medication is $11.46.
- *Other health professionals*: For this medical service type there is only an Australia-wide estimate. The average cost per visit to another health professional is $61.24.

Appendix D. Method for estimation of standard errors and confidence intervals

With the exception of analysis of Table 5.1, all the standard errors in this paper are based on the 'jackknife method', which calculates the effect of each unit on the estimate. If there are *n* units in the sample, then *n* estimates are calculated from the sample where a single different unit is removed each time from the total sample. The variance estimate is then based on the difference between these estimates and the estimate obtained from the total sample (Wonnacott & Wonnacott 1984:250–1). The advantage of this method is that, even if the original estimate of variance is slightly biased (but asymptotically unbiased), the jackknife method will often eliminate the bias and produce consistent estimates of standard errors.

Given that jackknife errors were not obtained for the estimates of the proportion of the sample without health expenditure (Table 5.1), it is possible to derive some using the conventional binomial formula and adjusting for a design effect. That is, in order to account for the fact that the NHS is a complex sample rather than a simple random sample, the standard errors from the binomial formula need to be adjusted by a design effect.

The design effect was estimated as the factor by which the binomial standard errors must be scaled up to equate them with the (consistent) jackknife estimates of standard errors. This was done for both Indigenous and non-Indigenous population using the Table 6.2 jackknife estimates as the benchmark. For example, the jackknife estimates of the standard errors in that table were divided by the binomial estimates to derive a design effect specifically for all the estimates in Table 5.1.

Approximation of standard errors using the binomial formula and a design effect

Under simple random sampling (SRS), the estimate of variance of a proportion is given by

$$\hat{Var}_{SRS}(\hat{p}) = \frac{1}{n}\left(1-\frac{n}{N}\right)\hat{p}(1-\hat{p}) \qquad \text{B1:}$$

p = esitmate of proportion

n = sample size

$\hat{Var}_{SRS}$ = estimate of the variance of the estimate of proportion, assuming SRS

N = sample size

For large N, as in our case, we can simplify this to:

$$\hat{Var}_{SRS}(\hat{p}) = \frac{1}{n}\hat{p}(1-\hat{p}) \qquad \text{B2:}$$

Under a complex desigh the variance of the estimate can be estimated by:

$$\hat{Var}_{complex}(\hat{p}) = deff \times \hat{Var}_{SRS} \qquad (B3)$$
$$= deff \frac{1}{n} \hat{p}(1-\hat{p})$$

where *deff*=design effect

As indicated above, the design effect was calculated using the jackknife estimates for Table 6.2 and then used to scale up the estimated variances for a simple random sample using equation B3.

Combining standard errors for confidence intervals

This section provides a methodology of how to calculate standard errors for a difference in two random variables. From basic statistical theory, the variance (Var) of a difference is:

$$Var(x-y) = Var(x) + Var(y) - 2Cov(x,y) \qquad (B4)$$

Ignoring the co-variance (Cov) term, or rather assuming it is positive and bounding it below by 0, yields formula (B5):

$$se(x-y) = \sqrt{se(x)^2 + se(y)^2} \qquad (B5)$$

While this formula is theoretically valid under SRS only (i.e. assuming independence), it is widely used in publications based on complex household sample designs, such as the *Labour Force Status*. To test its validity under these circumstances a quick empirical study was undertaken using Indigenous data from the 1994 Australian Housing Survey (see ABS 2001 for details).

An alternative, more conservative approach, is to bound the co-variance using a Cauchy-Schwarz inequality (i.e. $Cov(x,y) =< se(x)se(y)$), which leads to the formula:

$$se(x-y) =< se(x) + se(y) \qquad (B6)$$

Equation B5 worked quite well in ABS (2001), while equation B6 was found to overestimate standard errors, but not drastically. While the co-variance cannot always be neglected, the ABS study provides no evidence against the use of equation B5 in surveys with Indigenous components. Also, equation B6 may not be a good alternative as, being an upper bound, it will always overestimate the true variation. Given the ABS previous experience, the confidence intervals and inferences in this paper use the formula in equation B5.