Appendix 1
Supporting documentation

This page intentionally left blank

Appendix 1.1: Project resources and output

Software

The main software used in the production of this atlas were:

HealthWIZ –data analysis and mapping
Harvard Graphics –charting
Microsoft Excel for Windows –correlation analysis
Microsoft Word for Windows –word processing

Hardware

A variety of IBM compatible microcomputers were used in the production of the atlas. A HP Laser Jet 5000 Series printer was used for printing drafts of the text and maps.

Printing

The atlas was printed by Openbook Publishers, Adelaide. They were supplied with word processing documents containing the text, tables, graphs and the maps (the maps were pasted into frames in the document). The atlas was then electronically transferred to plates for offset printing, without the need for film or bromides.

Project output

Data in electronic and printed form

Separate atlases are available for each State and Territory and for Australia. For each atlas there is a companion volume comprising the data on which the maps are based: for Queensland, it is Volume 4.1. Both of these can be purchased from Government Info Shops in the capital cities.

The text and maps can also be downloaded for reading and printing from the Public Health Information Development Unit World Wide Web site at www.publichealth.gov.au

In addition, the text, maps and data can be accessed electronically from a CD-ROM (for Windows). On the CD-ROM, the text is in documents in Microsoft Word format. The data are in spreadsheet files in Microsoft Excel format and include all of the data mapped in the atlas, in table format as presented in Volume 4.1. Some data are also available in the HealthWIZ database.

Additional analyses will be posted to the Public Health Information Development Unit web site from time to time.

HealthWIZ software

HealthWIZ is a comprehensive health statistics database product, with a small area focus, produced by the Commonwealth Department of Health and Aged Care. It is comprised of detailed, content-rich data collections from Australia's hospital systems, cause of death registries, Medicare and social security payment systems and population censuses, together with data from administrative systems such as aged care and child care.

The data are contained on a CD-ROM and are accompanied by high performance table-building software. The menu-driven interface allows for a range of statistical calculations (age-standardised rates, confidence intervals, indices, time series data) to be undertaken to choose the most appropriate for the dataset and the needs of the user. These calculations are built into the software. The HealthWIZ software is also accessible via the World Wide Web at www.prometheus.com.au

HealthWIZ Version 4.0 comes with an integrated high performance mapping module. All the datasets and variables in the database can be mapped without the need for specialist knowledge of mapping software. All necessary digitised boundaries are included for users to be able to copy the maps to their own documents for publication.

Selected data from the atlas will be available in HealthWIZ. This includes all of the deaths and income support payments data, as well most of the hospital data, although its inclusion is subject to approval from the States and Territories. Its inclusion in HealthWIZ will allow greater flexibility in mapping the variables in the atlas, as well as many more variables from the same and other topics. The Census data, as well as the remaining health status data (the disability and handicap predictions, Total Fertility Rate), cannot be incorporated at this stage because of restrictions imposed on its use by the Australian Bureau of Statistics.

This page intentionally left blank

Appendix 1.2: Geographic areas mapped

Introduction

The following notes are intended to amplify and explain points raised in Chapter 2, *Methods* as to the areas mapped in this atlas.

Areas

Background

The basic geographic area mapped is the Statistical Local Area (SLA: SLAs are described in Chapter 2). The Statistical Local Area (SLA) is mapped in the whole of State map: for **Brisbane, Gold Coast-Tweed Heads** and **Townsville-Thuringowa** SLAs have been grouped to form larger areas. The groupings approximate (and are frequently the same as) individual postcode areas: see 'Areas mapped in major urban centres', below. Maps have been produced in the HealthWIZ software using an approximation to Lambert's Conformal Conic Projection.

The SLA was chosen as the unit to be mapped because some datasets were only available by SLA and others were only available by postcode. It is possible to estimate data for SLAs from postcode datasets for much of Australia (basically where SLAs are larger than postcode areas, which is generally the case for areas other than in **Brisbane, Gold Coast-Tweed Heads, Townsville-Thuringowa**, **Darwin** and **Canberra**). Further, although many SLAs outside of the capital cities are of limited value for analysis (because of their large size and the often variable composition of their population) postcodes present a number of additional problems. For example, for many people living outside of a town their postcode, as used in administrative records, is the postcode of the town (i.e. the postcode of their postal address), rather than the postcode of the place in which they live. In addition, postcode areas in the country frequently cover large areas, which may not be contiguous. For example, a postcode may cover a town and the population living in a number of other towns and rural areas along a major highway, some as far as 100 or more kilometres away. Intervening towns may have a different postcode.

Areas in Brisbane

The SLAs mapped for **Brisbane**, **Gold Coast-Tweed Heads** and **Townsville-Thuringowa** and the Rest of State are shown in **Maps A1** and **A2** and listed in the accompanying tables. Copies of the boundaries to use as overlays with the maps in this volume are in a pocket inside the back cover.

The SLA of Unincorporated Islands had fewer than 100 people and was not mapped in any chapter. In addition, small numbers of cases were also excluded from the analysis in other chapters. For example, where the number of deaths in any area that was expected from the Australian rates was below five, the data was not mapped. Similar exclusions applied to the other data in Chapter 5 and to the data mapped in Chapter 6. The particular exclusions are noted in each chapter.

Areas mapped in major urban centres

In **Brisbane, Gold Coast-Tweed Heads** and **Townsville-Thuringowa**, SLAs are based on suburbs and are relatively small (and much smaller on average than SLAs in most other large cities). SLAs in **Canberra** and **Darwin** are also suburb based. Small SLAs are likely to have smaller numbers of cases (whether of population, hospital admissions or of deaths) and these are likely to produce results (percentages, ratios) which are less reliable than those for larger areas. Throughout the atlas, estimates with small numbers of cases have not been mapped. To ensure that the majority of areas in these major urban centres are of sufficient size to produce useful results, many of the SLAs have been grouped to form larger areas. The groupings approximate (and are frequently the same as) individual postcode areas. **Table A3** shows the way in which the SLAs have been treated: whether they have been mapped as individual SLAs, or a group of SLAs, and whether that group is equivalent to a postcode area. The table also shows the area name used in the text.

The areas mapped for **Brisbane, Gold Coast-Tweed Heads** and **Townsville-Thuringowa** are shown in **Map A1** and listed in the accompanying tables. Copies of the boundaries to use as overlays with the maps in this volume are in a pocket inside the back cover.

Areas mapped in non-metropolitan areas

As noted above, the data for non-metropolitan areas in Queensland is mapped by SLA. SLAs which are predominantly urban centres (towns) have been separately identified and located on the maps as a circle. Many urban centres are not separate SLAs.

To increase the number and range of urban centres for which data could be published, an urban centre with a population of 7,500 or more was mapped separately where it comprised 75 per cent or more of the SLA in which it was located. This resulted in 15 of the 24 urban centres of this size in Queensland being mapped (**Table A1**). Four of these urban centres include several SLAs: these are highlighted in bold in **Table A1** and the component SLAs are shown in **Table A2**. The 75 per cent rule was applied to each of the SLAs in the urban centre, and the combined area was represented on the map by a circle. Cairns Northern Beaches is an urban centre in its own right (comprised of the SLA of Cairns (C)-Northern Suburbs), separate from the urban centre of Cairns. On advice from local authorities it has been included in the maps in this atlas as part of the larger urban area of Cairns.

Table A2: Urban centres in Queensland

Urban centre	Population		
	Urban centre	SLA	Urban centre as % of SLA
Mapped: urban centres comprising 75% or more of SLA[1]			
Noosa	**20,395**	**20,395**	**100.0**
Nambour	11,397	11,397	100.0
Warwick	10,947	10,947	100.0
Dalby	9,517	9,517	100.0
Charter Towers	8,893	8,893	100.0
Gladstone	26,415	26,415	99.9
Kawana	16,264	16,389	99.2
Toowoomba	**82,443**	**83,633**	**98.6**
Caloundra	**28,329**	**29,096**	**97.4**
Bundaberg	41,025	42,842	95.8
Mount Isa	21,751	22,866	95.1
Rockhampton	56,375	59,732	94.4
Cairns	**92,273**	**105,538**	**87.4**
Maryborough	21,286	24,868	85.6
Hervey Bay	32,054	42,391	75.6
Not mapped: urban centres comprising less than 75% of SLA			
Mackay	44,880	60,703	73.9
Gympie	10,813	15,147	71.4
Emerald	9,345	13,312	70.2
Maroochydore-Mooloolaba	36,406	52,419	69.5
Bowen	8,985	14,411	62.3
Buderim	12,458	24,213	51.5
Ayr	8,697	18,957	45.9
Innisfail	8,987	20,777	43.3
Yeppoon	8,810	24,796	35.5

[1] Urban centres highlighted in bold are comprised of combinations of SLAs - see Table A3

Source: Compiled from 1996 ABS Census data

In cases where the area of the SLA is larger than the area of the circle, the underlying SLA can be seen on the map: both are mapped in the same shade. Where the location of the circle in its correct geographic position would have hidden details of another SLA, the circle has been located off the map, with a line adjoining the circle and the correct geographic location. Similarly, areas on the map that are too small for variations in the shading to be seen have been enlarged and located off the map.

The areas mapped for the whole of State are shown in **Map A2** and listed in **Table A4**. Copies of the boundaries to use as overlays with the maps in this volume are in a pocket inside the back cover.

Table A3: Names used for towns comprised of multiple Statistical Local Areas

SLA	Name
Cairns (C)-Barron	Cairns
Cairns (C)-Central Suburbs	Cairns
Cairns (C)-City	Cairns
Cairns (C)-Mt Whitfield	Cairns
Cairns (C)-Northern Suburbs[1]	Cairns
Cairns (C)-Trinity	Cairns
Cairns (C)-Western Suburbs	Cairns
Caloundra (C)-Caloundra N.	Caloundra
Caloundra (C)-Caloundra S.	Caloundra
Noosa (S)-Noosa-Noosaville	Noosa
Noosa (S)-Sunshine-Peregian	Noosa
Noosa (S)-Tewantin	Noosa
Toowoomba (C)-Central	Toowoomba
Toowoomba (C)-North-East	Toowoomba
Toowoomba (C)-North-West	Toowoomba
Toowoomba (C)-South-East	Toowoomba
Toowoomba (C)-West	Toowoomba

[1] See note in the text above re the inclusion of this SLA as part of Cairns '

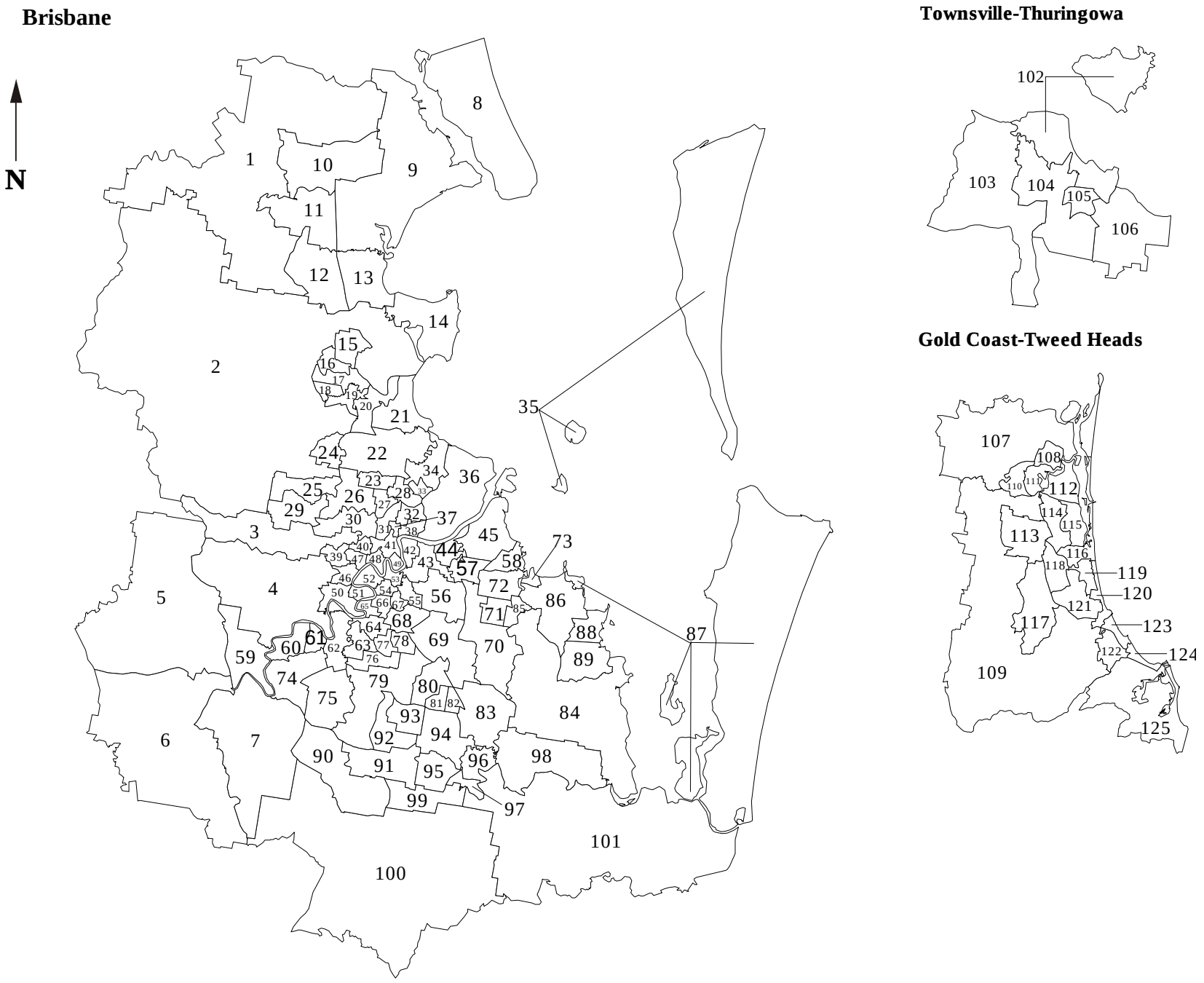
Source: Compiled from 1996 ABS Census data

Boundary changes

The boundaries of some SLAs have changed over the periods for which the data has been collected (varying from one year to four years). In a small number of cases this meant that comparisons between the datasets based on different boundaries could not be made. For example, boundary changes to the SLAs of Ipswich (C) and Moreton (S) Part A in 1995 and 1996 meant that, for the 1996 Census data to be correlated with the data for deaths and hospital admissions, several areas had to be combined. Data for deaths and hospital admissions coded to Ipswich (C) and Moreton (S) Part A (and its component parts of Bellbird, Camira etc.) were combined, as were the 1996 Census SLAs of Ipswich-Central, -North and -East. These combinations produced comparable areas for analysis. A list of the areas grouped and the name assigned to each is included in the beginning of the relevant chapter.

Map A1
Key to areas mapped for Brisbane, Gold Coast-Tweed Heads and Townsville-Thuringowa

(also included as a clear film overlay inside back cover flap)



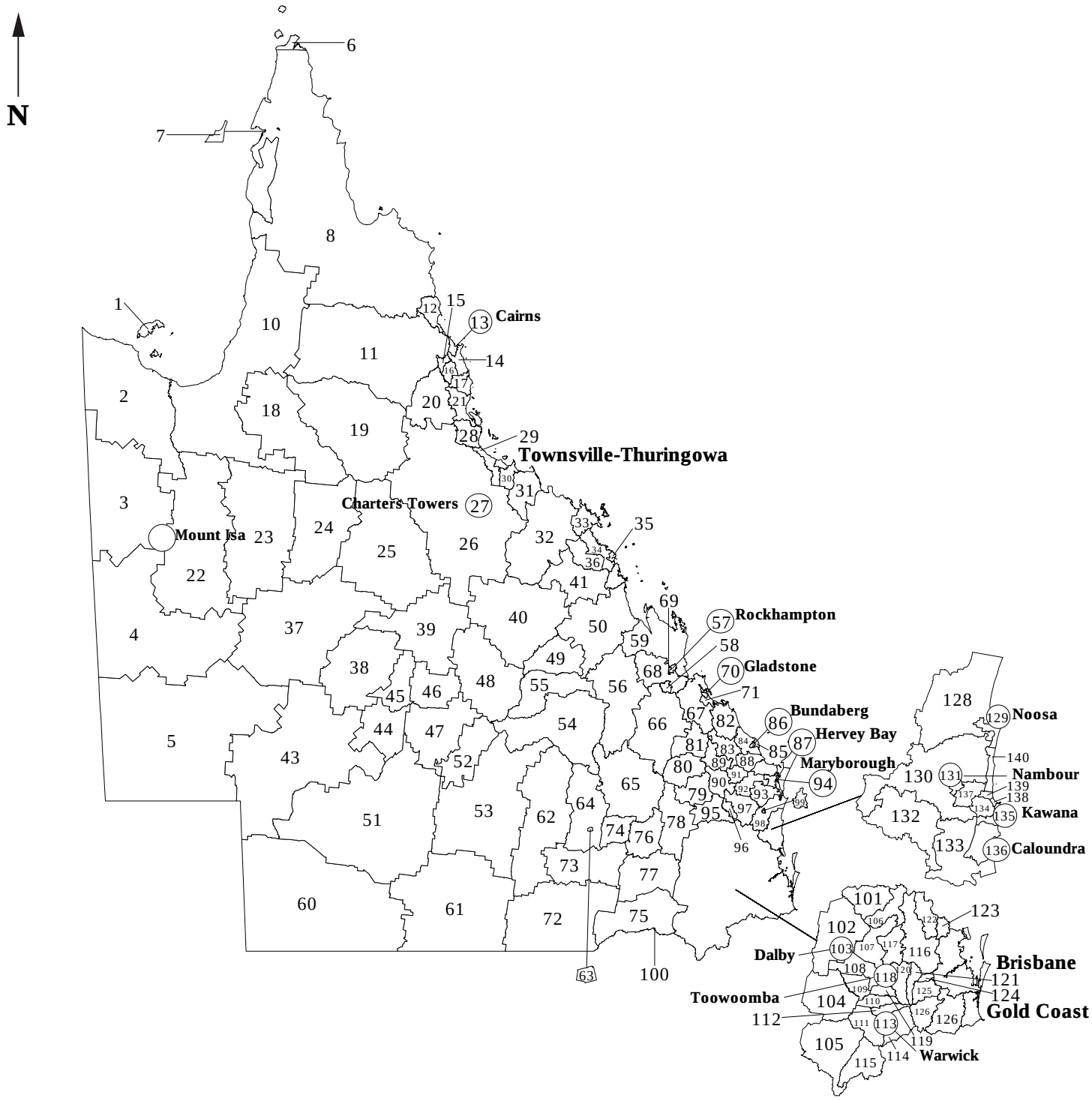
Source: Calculated on data from ABS 1996 Census

Scale: Details of map boundaries are in Appendix 1.2

National Social Health Atlas Project, 1999

Map A2
Key to areas mapped for Queensland

(also included as a clear film overlay inside back cover flap)



[1]*See footnotes to Table A5 for details of differences in boundaries for areas prior to 1996*

Details of map boundaries are in Appendix 1.2

Table A3: Key to small areas in Brisbane, Gold Coast and Townsville-Thuringowa, 1996

Area no.	SLA	Postcode number	Group/Area name used	Area no.	SLA	Postcode number	Area name used
	Brisbane				**Brisbane**		
13	Deception Bay[1]	..	Deception Bay	30	Wilston	4051-4052	Wilston/Enoggera
91	Browns Plains[1]	..	Browns Plains	26	Everton Park	..	Stafford Heights/Mitchelton
90	Greenbank [Part B][1]	..	Greenbank [Part B]	26	McDowall	..	Stafford Heights/Mitchelton
97	Waterford West[1]	..	Waterford West	26	Mitchelton	..	Stafford Heights/Mitchelton
99	Logan Balance[1]	..	Logan Balance	26	Stafford	..	Stafford Heights/Mitchelton
74	Darra-Sumner	..	Darra-Sumner/Wacol	26	Stafford Heights	..	Stafford Heights/Mitchelton
74	Wacol	..	Darra-Sumner/Wacol	25	Arana Hills	..	Ferny Hills/Everton Hills
6	Ipswich-Central[2]	..	Ipswich Central	25	Everton Hills	..	Ferny Hills/Everton Hills
7	Ipswich-East[2]	..	Ipswich-East	25	Ferny Hills	..	Ferny Hills/Everton Hills
5	Ipswich-North[2]	..	Ipswich-North	29	Ferny Grove	..	Keperra/Upper Kedron
48	City	4000	City/Spring Hill	29	Keperra	..	Keperra/Upper Kedron
48	Spring Hill	4000	City/Spring Hill	29	Upper Kedron	..	Keperra/Upper Kedron
41	Bowen Hills	4006	Herston/Newstead	40	Kelvin Groves	4059	Red Hill/Kelvin Groves
41	Fortitude Valley	4006	Herston/Newstead	40	Red Hill	4059	Red Hill/Kelvin Groves
41	Herston	4006	Herston/Newstead	3	Ashgrove	4060-4061	Ashgrove/The Gap
41	Newstead	4006	Herston/Newstead	3	The Gap	4060-4061	Ashgrove/The Gap
38	Ascot	4007	Ascot/Hamilton	47	Milton	4064	Milton/Paddington
38	Hamilton	4007	Ascot/Hamilton	47	Paddington	4064	Milton/Paddington
36	Pinkenba-Eagle Farm	..	Pinkenba-eagle Farm	39	Bardon	4065	Bardon
37	Albion	4010	Albion	46	Toowong	4066	Toowong
32	Clayfield	4011	Clayfield/Hendra	51	St Lucia	4067	St Lucia
32	Hendra	4011	Clayfield/Hendra	50	Chelmer	4068	Chelmer/Taringa
28	Nundah	4012	Nundah/Wavell Heights	50	Indooroopilly	4068	Chelmer/Taringa
28	Wavell Heights	4012	Nundah/Wavell Heights	50	Taringa	4068	Chelmer/Taringa
33	Northgate	..	Northgate	4	Brookfield (incl. Mt Cootha Pk)	4069	Upper Brookfield/Fig Tree Pocket
34	Banyo	4014	Nudgee Beach/Virginia	4	Chapel Hill	4069	Upper Brookfield/Fig Tree Pocket
34	Nudgee	4014	Nudgee Beach/Virginia	4	Fig Tree Pocket	4069	Upper Brookfield/Fig Tree Pocket
34	Nudgee Beach	4014	Nudgee Beach/Virginia	4	Kenmore	4069	Upper Brookfield/Fig Tree Pocket
34	Virginia	4014	Nudgee Beach/Virginia	4	Kenmore Hills	4069	Upper Brookfield/Fig Tree Pocket
21	Bracken Ridge	4017+	Bracken Ridge/Sandgate	4	Pinjarra Hills	4069	Upper Brookfield/Fig Tree Pocket
21	Brighton	4017+	Bracken Ridge/Sandgate	4	Pullenvale	4069	Upper Brookfield/Fig Tree Pocket
21	Deagon	4017+	Bracken Ridge/Sandgate	4	Upper Brookfield	4069	Upper Brookfield/Fig Tree Pocket
21	Sandgate	4017+	Bracken Ridge/Sandgate	59	Anstead	4070	Anstead/Bellbowrie/Moggill
14	Clontarf	4019-4022	Redcliffe	59	Bellbowrie	4070	Anstead/Bellbowrie/Moggill
14	Margate-Woody Point	4019-4022	Redcliffe	59	Moggill	4070	Anstead/Bellbowrie/Moggill
14	Redcliffe-Scarborough	4019-4022	Redcliffe	61	Seventeen Mile Rock	4070	Seventeen Mile Rock
14	Rothwell-Kippa-Ring	4019-4022	Redcliffe	60	Jamboree Height	4074	Jindalee/River Hills
35	Moreton Island	4025	Moreton Island	60	Jindalee	4074	Jindalee/River Hills
31	Lutwyche	4030	Windsor/Lutwyche/Wooloowin	60	Middle Park	4074	Jindalee/River Hills
31	Windsor	4030	Windsor/Lutwyche/Wooloowin	60	Mount Ommaney	4074	Jindalee/River Hills
31	Wooloowin	4030	Windsor/Lutwyche/Wooloowin	60	Riverhills	4074	Jindalee/River Hills
27	Kedron	4031	Kedron	60	Westlake	4074	Jindalee/River Hills
23	Chermside	4032	Chermside West/Chermside	62	Corinda	4075	Graceville/Oxley
23	Chermside West	4032	Chermside West/Chermside	62	Graceville	4075	Graceville/Oxley
22	Aspley	4034+	Bridgeman Downs/Boondall	62	Oxley	4075	Graceville/Oxley
22	Boondall	4034+	Bridgeman Downs/Boondall	62	Sherwood	4075	Graceville/Oxley
22	Bridgeman Downs	4034+	Bridgeman Downs/Boondall	75	Doolandella-Forest Lake	4077	Inala/Durack/Doolandella-Forest Lake/Ellen Groves/Richlands
22	Carseldine	4034+	Bridgeman Downs/Boondall	75	Durack	4077	Inala/Durack/Doolandella-Forest Lake/Ellen Groves/Richlands
22	Geebung	4034+	Bridgeman Downs/Boondall	75	Ellen Groves	4077	Inala/Durack/Doolandella-Forest Lake/Ellen Groves/Richlands
22	Taigum-Fitzgibbon	4034+	Bridgeman Downs/Boondall	75	Inala	4077	Inala/Durack/Doolandella-Forest Lake/Ellen Groves/Richlands
22	Zillmere	4034+	Bridgeman Downs/Boondall	75	Richlands	4077	Inala/Durack/Doolandella-Forest Lake/Ellen Groves/Richlands
24	Albany Creek	..	Albany Creek	52	Highgate Hill	4101	West End/South Brisbane/Highgate Hill
2	Pine River Balance	..	Pine Rivers Balance	52	South Brisbane	4101	West End/South Brisbane/Highgate Hill
30	Alderley	4051-4052	Wilston/Enoggera	52	Highgate Hill	4101	West End/South Brisbane/Highgate Hill
30	Enoggera	4051-4052	Wilston/Enoggera	54	Dutton Park	4102	Dutton Park/Woolloongabba

Table A3: Key to small areas in Brisbane, Gold Coast and Townsville-Thuringowa, 1996 ... *cont*

Area no.	SLA	Postcode number	Area name used	Area no.	SLA	Postcode number	Area name used
	Brisbane ... *cont*				**Brisbane ... *cont***		
54	Woolloongabba	4102	Dutton Park/Woolloongabba	72	Gumdale	4154	Gumdale/Ransome/Wakerley
66	Annerley	4103	Annerley/Fairfield	72	Ransome	4154	Gumdale/Ransome/Wakerley
66	Fairfield	4103	Annerley/Fairfield	72	Wakerley	4154	Gumdale/Ransome/Wakerley
65	Yeronga	4104	Yeronga	71	Chandler	4155	Chandler
64	Moorooka	4105	Moorooka/Yeerongpilly	84	Capalaba	4157, 4165	Capalaba/Redland Bay
64	Yeerongpilly	4105	Moorooka/Yeerongpilly	84	Redland Bay	4157, 4165	Capalaba/Redland Bay
63	Rocklea	4106	Rocklea	84	Sheldon-Mt Cotton	4157, 4165	Capalaba/Redland Bay
77	Salisbury	4107	Salisbury	84	Victoria Point	4157, 4165	Capalaba/Redland Bay
76	Archerfield	4108	Archerfield/Coopers Plains	73	Thorneside	4158	Thorneside
76	Coopers Plains	4108	Archerfield/Coopers Plains	86	Alexandra Hills	4159-4161	Birkdale/Ormiston
79	Acacia Ridge	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	86	Birkdale	4159-4161	Birkdale/Ormiston
79	MacGregor	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	86	Ormiston	4159-4161	Birkdale/Ormiston
79	Pallara-Heathwood-Larapinta	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	86	Wellington Point	4159-4161	Birkdale/Ormiston
79	Robertson	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	88	Cleveland	4163	Cleveland
79	Sunnybank	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	89	Thornlands	4164	Thornlands
79	Sunnybank Hills	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	53	East Brisbane	4169	East Brisbane/Kangaroo Point
79	Willawong	4109-4110	MacGregor/Pallara-Heathwood-Larapinta	53	Kangaroo Point	4169	East Brisbane/Kangaroo Point
78	Nathan	4111	Nathan	43	Cannon Hill	4170	Cannon Hill/Morningside/Norman Park
81	Kuraby	4112	Kuraby	43	Morningside	4170	Cannon Hill/Morningside/Norman Park
80	Eight Mile Plains	4113	Runcorn/Eight Mile Plains	43	Norman Park	4170	Cannon Hill/Morningside/Norman Park
80	Runcorn	4113	Runcorn/Eight Mile Plains	42	Balmoral	4171	Balmoral/Bulimba/Hawthorne
94	Berrinba-Karawatha	4114, 4117	Berrinba-Karawatha/Kingston	42	Bulimba	4171	Balmoral/Bulimba/Hawthorne
94	Kingston	4114, 4117	Berrinba-Karawatha/Kingston	42	Hawthorne	4171	Balmoral/Bulimba/Hawthorne
94	Woodridge	4114, 4117	Berrinba-Karawatha/Kingston	44	Murarrie	4172	Murarrie
92	Algester	4115	Algester/Parkinson-Drewvale	57	Tingalpa	4173	Tingalpa
92	Parkinson-Drewvale	4115	Algester/Parkinson-Drewvale	45	Hemmant-Lytton	4174, 4178	Hemmant-Lytton/Wynnum/Wynnum West
93	Calamvale	4116	Calamvale/Stretton	45	Wynnum	4174, 4178	Hemmant-Lytton/Wynnum/Wynnum West
93	Stretton	4116	Calamvale/Stretton	45	Wynnum West	4174, 4178	Hemmant-Lytton/Wynnum/Wynnum West
82	Underwood	4119	Underwood	58	Lota	4179	Lota/Manly/Manly West
67	Greenslopes	4120	Greenslopes	58	Manly	4179	Lota/Manly/Manly West
68	Holland Park	4121	Holland Park/Tarragindi	58	Manly West	4179	Lota/Manly/Manly West
68	Holland Park West	4121	Holland Park/Tarragindi	87	Redland Balance	4183-4184	Redland Balance
68	Tarragindi	4121	Holland Park/Tarragindi	101	Beenleigh	4205, 4207-4208	Albert [Part A]
69	Mansfield	4122+	Mt Gravatt/Rochedale	101	Bethania-Waterford	4205, 4207-4208	Albert [Part A]
69	Mount Gravatt	4122+	Mt Gravatt/Rochedale	101	Eagleby	4205, 4207-4208	Albert [Part A]
69	Mount Gravatt East	4122+	Mt Gravatt/Rochedale	101	Edens Landing-Holmview	4205, 4207-4208	Albert [Part A]
69	Rochedale	4122+	Mt Gravatt/Rochedale	101	Mt Warren Park	4205, 4207-4208	Albert [Part A]
69	Upper Mount Gravatt	4122+	Mt Gravatt/Rochedale	101	Windaroo-Bannockburn	4205, 4207-4208	Albert [Part A]
69	Wishart	4122+	Mt Gravatt/Rochedale	101	Gold Coast Balance in BSD	4205, 4207-4208	Albert [Part A]
83	Daisy Hill-Priestdale	..	Rochedale South/Slacks Creek	100	Greenbank [Part A]	..	Greenbank [Part A]/Beaudesert
83	Rochedale South	..	Rochedale South/Slacks Creek	100	Beaudesert Balance in BSD	..	Greenbank [Part A]/Beaudesert
83	Slacks Creek	..	Rochedale South/Slacks Creek	20	Bald Hills	..	Bald Hills
83	Springwood	..	Rochedale South/Slacks Creek	85	Capalaba West	..	Capalaba West
98	Carbrook Cornubia	4128-4130	Tanah Merah/Carbrook Cornubia	49	New Farm	..	New Farm
98	Loganholme	4128-4130	Tanah Merah/Carbrook Cornubia	8	Bribie Island[3]	..	Bribie Island
98	Shailer Park	4128-4130	Tanah Merah/Carbrook Cornubia	12	Burpengary-Narangba[3]	..	Burpengary-Narangba
98	Tanah Merah	4128-4130	Tanah Merah/Carbrook Cornubia	10	Caboolture-Central[3]	..	Caboolture-Central
96	Loganlea	4131	Loganlea	9	Caboolture-East[3]	..	Caboolture-East
95	Marsden	4132	Marsden	11	Morayfield[3]	..	Morayfield
55	Coorparoo	4151	Coorparoo	1	Caboolture Balance in BSD[3]	..	Caboolture Balance
56	Camp Hill	4152	Camp Hill/Carindale	18	Bray Park	..	Bray Park
56	Carindale	4152	Camp Hill/Carindale	15	Kallangur	..	Kallangur
56	Carina	4152	Camp Hill/Carindale	17	Lawnton	..	Lawnton
56	Carina Heights	4152	Camp Hill/Carindale	16	Petrie	..	Petrie
70	Belmont-Mackenzie	4153, 4156	Burbank/Belmont-Mackenzie	19	Strathpine	..	Strathpine
70	Burbank	4153, 4156	Burbank/Belmont-Mackenzie				

Table A3: Key to small areas in Brisbane, Gold Coast and Townsville-Thuringowa, 1996 ... cont

Area no.	SLA	Postcode number	Area name used	Area no.	SLA	Postcode number	Area name used
	Gold Coast				**Townsville**		
107	Coomera-Cedar Creek	..	Coomera-Cedar Creek	102	City (Townsville)	4810, 4819	Townsville Coastal/Magnetic Island
109	Guanaba-Currumbin Valley	..	Guanaba-Currumbin Valley	102	Magnetic Island	4810, 4819	Townsville Coastal/Magnetic Island
111	Helensvale	..	Helensvale	102	North Ward-Castle Hill	4810, 4819	Townsville Coastal/Magnetic Island
117	Mudgeeraba	4213	Worongary-Tallai/Mudgeeraba	102	Pallarenda-Shelley Beach	4810, 4819	Townsville Coastal/Magnetic Island
117	Worongary-Tallai	4213	Worongary-Tallai/Mudgeeraba	102	Railway Estate	4810, 4819	Townsville Coastal/Magnetic Island
114	Arundel	4214	Arundel/Ashmore	102	Rowes Bay-Belgian Gardens	4810, 4819	Townsville Coastal/Magnetic Island
114	Ashmore	4214	Arundel/Ashmore	102	South Townsville	4810, 4819	Townsville Coastal/Magnetic Island
114	Ernest-Molendinar	4214	Arundel/Ashmore	102	West End	4810, 4819	Townsville Coastal/Magnetic Island
114	Parkwood	4214	Arundel/Ashmore	106	Oonoonba-Idalia-Cluden	4811	Townsville South East
115	Labrador	4215	Labrador/Southport	106	Stuart-Roseneath	4811	Townsville South East
115	Southport	4215	Labrador/Southport	106	Wulguru	4811	Townsville South East
112	Biggera Waters	4216	Paradise Point/Biggera Waters	105	Currajong	4812	Gulliver/Hermit Park
112	Coombabah	4216	Paradise Point/Biggera Waters	105	Gulliver	4812	Gulliver/Hermit Park
112	Hollywell	4216	Paradise Point/Biggera Waters	105	Hermit Park	4812	Gulliver/Hermit Park
112	Paradise Point	4216	Paradise Point/Biggera Waters	105	Hyde Park-Mysterton	4812	Gulliver/Hermit Park
112	Runaway Bay	4216	Paradise Point/Biggera Waters	105	Mundingburra	4812	Gulliver/Hermit Park
116	Benowa	4217	Surfers Paradise/Benowa	105	Pimlico	4812	Gulliver/Hermit Park
116	Bundall	4217	Surfers Paradise/Benowa	105	Rosslea	4812	Gulliver/Hermit Park
116	Main Beach-Broadwater	4217	Surfers Paradise/Benowa	103	Kelso	..	Thuringowa [Part A]
116	Surfers Paradise	4217	Surfers Paradise/Benowa	103	Kirwan	..	Thuringowa [Part A]
119	Broadbeach Waters	..	Broadbeach Waters/Mermaid Waters	103	Thuringowa [Part A] Balance	..	Thuringowa [Part A]
119	Mermaid Waters	..	Broadbeach Waters/Mermaid Waters	104	Aitkenvale	..	Murray/Mt Louisa
120	Broadbeach	..	Broadbeach/Burleigh Heads	104	Cranbrook	..	Murray/Mt Louisa
120	Burleigh Heads	..	Broadbeach/Burleigh Heads	104	Douglas	..	Murray/Mt Louisa
120	Mermaid Beach	..	Broadbeach/Burleigh Heads	104	Garbutt	..	Murray/Mt Louisa
120	Miami	..	Broadbeach/Burleigh Heads	104	Heatley	..	Murray/Mt Louisa
123	Currumbin	..	Palm Beach/Currumbin	104	Mt Louisa-Mt St John-Bohle	..	Murray/Mt Louisa
123	Palm Beach	..	Palm Beach/Currumbin	104	Murray	..	Murray/Mt Louisa
122	Currumbin Waters	..	Currumbin Waters/Elanora	104	Vincent	..	Murray/Mt Louisa
122	Elanora	..	Currumbin Waters/Elanora				
124	Bilinga	4224-4225	Coolangatta/Tugun				
124	Coolangatta	4224-4225	Coolangatta/Tugun				
124	Tugun	4224-4225	Coolangatta/Tugun				
121	Burleigh Waters	..	Robina/Kerrydale/Burleigh Waters				
121	Kerrydale-Stephens	..	Robina/Kerrydale/Burleigh Waters				
121	Robina-Clear Island Waters	..	Robina/Kerrydale/Burleigh Waters				
113	Nerang	..	Nerang				
125	Tweed [Part A]	..	Tweed [Part A]				
110	Oxenford	..	Oxenford				
108	Hope Island	..	Hope Island				
118	Carrara-Merrimac	..	Carrara-Merrimac				

[1] Greenbank [Part B], Waterford West and Logan Balance have been mapped as Greenbank [Part B]/Waterford West for variables in chapter 5

[2] Ipswich-Central, Ipswich-North and Ipswich-East have been mapped as Ipswich, Moreton-Bellbird-Park, -Camira, -Carole Park, -Karalee, -Balance-North, -Balance-South for variables in chapters 5 and 6

[3] Bribie Island, Burpengary-Narangba, Caboolture-Central, Caboolture-East, Deception Bay, Morayfield and Caboolture Bal in BSD have been mapped as Caboolture [Part A] for variables in chapters 5 and 6

Source: Compiled from project sources

Table A4: Key to Statistical Local Areas mapped in the non-metropolitan areas of Queensland, 1996

Area no.	ARIA	Statistical Local Area code	name	Area no.	ARIA	Statistical Local Area code	name	Area no.	ARIA	Statistical Local Area code	name	Area. no.	ARIA	Statistical Local Area code	name
39	5	150	Aramac (S)	78	3	2350	Chinchilla (S)	122	2	4250	Kilcoy (S)	51	5	6150	Quilpie (S)
15	3	200	Atherton (S)	110	1	2400	Clifton (S)	97	2	4300	Kilkivan (S)	24	5	6300	Richmond (S)
9	5	250	Aurukun (S)	22	4	2450	Cloncurry (S)	101	2	4350	Kingaroy (S)	57	1	6350	Rockhampton (C)
72	4	300	Balonne (S)	8	5	2501	Cook (S) (excl. Weipa)	83	2	4400	Kolan (S)	63	3	6400	Roma (T)
66	3	350	Banana (S)	7	5	2504	Weipa (S) (Cook)	121	1	4450	Laidley (S)	107	1	6450	Rosalie (S)
46	5	400	Barcaldine (S)	98	1	2532	Cooloola (S) (excl. Gympie)[6]	59	2	4550	Livingstone (S)	42	3	6550	Sarina (S)
43	5	450	Barcoo (S)	99	1	2535	Gympie (S) (Cooloola)[7]	38	5	4700	Longreach (S)	115	2	6600	Stanthorpe (S)
54	4	500	Bauhinia (S)	117	1	2550	Crow ŝ Nest (S)	35	3	4762	Mackay (C) [Part A]	52	5	6650	Tambo (S)
127	1	557	Beaudesert (S) [Part B]	18	5	2600	Croydon (S)	34	3	4765	Mackay (C) [Part B][9]	77	3	6700	Tara (S)
40	4	600	Belyando (S)	103	1	2650	Dalby (T)	23	5	4800	McKinlay (S)	65	4	6750	Taroom (S)
74	3	650	Bendemere (S)	26	4	2700	Dalrymple (S)[2]	11	4	4850	Mareeba (S)	29	3	6831	Thuringowa (C) [Part B][2]
91	2	700	Biggenden (S)	5	5	2750	Diamantina (S)	134	1	4902	Maroochy (S) Buderim	93	2	6850	Tiara (S)
47	5	750	Blackall (S)	12	3	2800	Douglas (S)	140	1	4905	Maroochy (S) Coastal North	118	1	6901	Toowoomba (C)
125	2	800	Boonah (S)	56	3	2850	Duaringa (S)	139	1	4907	Maroochy (S) Maroochydore	6	5	6950	Torres
62	4	850	Booringa (S)	16	3	2900	Eacham (S)	138	1	4911	Maroochy (S) Mooloolaba	30	3	7084	Townsville (C) [Part B][2]
4	5	900	Boulia (S)	80	3	2950	Eidsvold (S)	137	1	4917	Maroochy (S) Bal In S C ŝt SSD	75	3	7100	Waggamba (S)
32	4	950	Bowen (S)	55	4	3300	Emerald (S)	131	1	4914	Maroochy (S) Nambour	102	2	7150	Wambo (S)
50	3	1700	Broadsound (S)	116	1	3050	Esk (S)	130	1	4918	Maroochy (S) Balance[10]	73	4	7200	Warroo (S)
60	5	1750	Bulloo (S)	19	5	3100	Etheridge (S)	94	3	4950	Maryborough (C)[11]	113	1	7262	Warwick (S)-Central[13]
86	2	1810	Bundaberg (C)[1]	69	1	3151	Fitzroy (S) [Part A]	104	2	5000	Millmerran (S)	114	1	7263	Warwick (S)-East[14]
64	4	1850	Bungil (S)	68	2	3154	Fitzroy (S) [Part B]	36	3	5050	Mirani (S)	112	1	7265	Warwick (S)-North[15]
31	3	1900	Burdekin (S)[2]	25	5	3200	Flinders (S)	82	2	5100	Miriam Vale (S)	111	2	7266	Warwick (S)-West[16]
2	5	1950	Burke (S)	120	1	3250	Gatton (S)	81	3	5150	Monto (S)	33	3	7330	Whitsunday (S)
85	2	1981	Burnett (S) [Part A][1]	90	3	3300	Gayndah (S)	1	5	5250	Mornington (S)	37	5	7400	Winton (S)
84	2	1984	Burnett (S) [Part B][1]	70	2	3350	Gladstone (C)	3	4	5300	Mount Isa (C)	95	2	7450	Wondai (S)
123	1	2031	Caboolture (S) [Part B]	100	3	3600	Goondiwindi (T)	58	2	5350	Mount Morgan (S)	92	2	7500	Woocoo (S)[11]
13	2	2062	Cairns (C)	20	3	3700	Herberton (S)	79	3	5450	Mundubbera (S)				
14	3	2078	Cairns (C) [Part B][3]	87	3	3750	Hervey Bay (C)	96	2	5500	Murgon (S)				
71	2	2101	Calliope (S) [Part A]	28	3	3800	Hinchinbrook (S)	76	3	5550	Murilla (S)				
67	2	2104	Calliope (S) [Part B]	45	5	3850	Ilfracombe (S)	53	5	5600	Murweh (S)				
136	1	2132	Caloundra (C)[4]	105	3	3900	Inglewood (S)	106	2	5650	Nanango (S)				
135	1	2135	Caloundra (C)-Kawana[4]	125	1	3973	Ipswich (C)-South-West[8]	41	3	5700	Nebo (S)				
132	1	2136	Caloundra (C)-Hinterland[5]	124	1	3976	Ipswich (C)-West[8]	129	1	5752	Noosa (S)				
133	1	2138	Caloundra (C)-Rail Corridor[5]	88	2	4000	Isis	128	1	5758	Noosa (S) Balance[12]				
119	1	2150	Cambooya (S)	44	5	4050	Isisford (S)	61	5	5800	Paroo (S)				
21	3	2200	Cardwell (S)	48	5	4100	Jericho (S)	49	4	5850	Peak Downs (S)				
10	5	2250	Carpentaria (S)	17	3	4150	Johnstone (S)	89	3	5900	Perry (S)				
27	3	2300	Charter Towers (C)	108	1	4200	Jondaryan (S)	109	1	6050	Pittsworth (S)				

[1] Bundaberg, Burnett [Part A] and Bundaberg [Part B] have been mapped as Bundaberg/Burnett in Chapters 5 and 6
[2] Burdekin, Dalrymple, Thuringowa [Part B] and Townsville [Part B] have been mapped as Burdekin/Dalrymple/Thuringowa/Townsville in Chapters 5 and 6
[3] Cairns [Part B] is named Mulgrave [Part B] in Chapters 5 and 6
[4] Caloundra and Caloundra-Kawana have been mapped as Caloundra [Part A] in Chapters 5 and 6
[5] Caloundra-Hinterland and Caloundra-Rail Corridor have been mapped as Caloundra [Part B] in Chapters 5 and 6
[6] Cooloola (excl. Gympie) is named Widgee in Chapters 5 and 6
[7] Gympie (Cooloola) is named Gympie in Chapters 5 and 6
[8] lpswich-South-West and lpswich-West have been mapped as Moreton [Part B] in Chapters 5 and 6
[9] Mackay [Part B] is named Pioneer [Part B] in Chapters 5 and 6
[10] Maroochy Balance is named Maroochy [Part B] in Chapters 5 and 6
[11] Maryborough and Woocoo have been mapped as Maryborough/Woocoo in Chapters 5 and 6
[12] Noosa Balance is named Noosa [Part B] in Chapters 5 and 6
[13] Warwick Central is named Warwick in Chapters 5 and 6
[14] Warwick-East is named Glengallan in Chapters 5 and 6
[15] Warwick-North is named Allora in Chapters 5 and 6
[16] Warwick-West is named Rosenthal in Chapters 5 and 6
Source: Compiled from project sources

Appendix 1.3: Analysis and presentation of data

Data ranges settings

The selection of data ranges for the maps in this atlas took into account a variety of factors. These factors were:

- the data ranges used for other maps, particularly closely related maps;
- the number of areas in each range; and
- the 'balance' of the visual impact of the map.

Indirect standardisation

In comparing populations, for example the mortality of two populations, crude rates (eg. the number of deaths per 1,000 persons) may be misleading. Mortality, for example, depends strongly on age and sex. If the two areas have different age structures this variation alone may explain a difference in crude rates. The technique of standardisation is used to prevent variations in population structure from distorting differentials in events.

Indirect standardisation, used in this analysis, calculates the number of events (eg. services by GPs) which would theoretically occur if the rates for each age/sex group in a given population (the standard – in this case the population of Queensland) were applied to the population of interest. The result is termed the 'expected' number of events. If the actual number of events is then divided by this expected number and expressed as a percentage, we obtain the standardised ratio, a figure which is independent of population age and sex structure.

Thus the standardised ratio for a particular area will show the percentage by which it differs from the experience found in the whole population. Taking an example, the Standardised Death Ratio for deaths of males in the area of Dutton Park/Woolloongabba was 246: that is, there were almost two and a half times the number of deaths of male residents of Dutton Park/Woolloongabba aged from 15 to 64 years (154 per cent more) than would have been the case had the Queensland rates applied in these suburbs. In other words, the ratio was substantially above the State average.

The data for persons (ie. the total of females and males) has been standardised for both age and sex. That is, standardised ratios have been produced using separate details of the number of males and females in each age group. This eliminates distortion of the data which may occur where the illness or death experience of males and females is different (eg. as in the case for circulatory system disease among the population under 65 years of age). The ages used for all but the deaths data were generally each five year age group from 0 to 4 years to 80 to 84 years, and 85 years and over. For the deaths data, the ages were the five year age groups for the population aged from 15 to 64 years for all but accidents, poisonings and violence (where a separate analysis was undertaken for 15 to 24 year olds) and infant deaths. In the case of infant deaths (deaths of children under 12 months of age), the Infant Death Rate was calculated; the Infant Death Rate is the number infant deaths per 1,000 live births. Standardised ratios (SRs) were not calculated for areas where fewer than five events (deaths, admissions, etc.) were expected from the State rates, because of the doubtful reliability of such small numbers. All cases were, however, retained in the analysis for the calculation of capital city and State/Territory totals and ratios.

In some areas, however, high ratios are due to the relatively high proportion of Aboriginal and/or Torres Strait Islander people. This occurs because, in the methodology used, a standard population with a fixed age structure is introduced. The mortality or morbidity, etc., for a particular population (eg. people in an SLA) is then adjusted to allow for discrepancies in age structure between the standard and the particular population. When the particular population includes a sub group with a substantially different age structure and health experience (for example, mortality experience) the process is distorted. Indigenous people represent such a population. They have a substantially lower life expectancy than the total population, are a much younger population, have higher age-specific death rates at all ages and their average age at death is lower. However, since data relating to Indigenous people is not adequately identified in, for example, death or hospital statistics, they cannot be analysed as a discrete group.

The high SRs for some data for areas with a relatively large proportion of Indigenous people therefore reflect, in part, that the data has not been effectively standardised. This does not invalidate the data for these areas – on the contrary, it highlights the inequity evident in the health of Indigenous people, and the urgent need to address this inequity, as well as the need to identify Indigenous people more accurately in the statistics.

It should be noted that SRs derived for each area by this indirect method are comparable only by relation to the standard population (the State population) and not directly with each other.

For variables presented as SRs the text and tables include details of whether the ratios were statistically significant ie. that they differed significantly from the standard. Whether an SR for an area differs significantly from the standard depends not only on the size of the ratio but also on the population size of the area and the overall rate for the particular event (eg. a cause of death, use of a general medical practitioner), both of which contribute to the 'expected' number of cases in an area. The same SR value in two areas which differ greatly in population size may be significantly different from the standard in the area with the larger population, but not so in the area with the smaller population.

Data sources

Table A5 shows data sources in addition to those noted in the footnotes to the tables in the earlier chapters. Further details of the HealthWIZ software (referenced in the table) are on page 387.

Table A5: Data sources

Chapter	Data sources
Chapter 4	
Tables	
4.2 to 4.11	Data for **1989** from *A Social Health Atlas of Australia 1992* . Data for **1996** is at 30 June and was compiled in HealthWIZ from data supplied by the DFACS (for all variables), DVA (Service Pension (Age) and Service Pension (Permanently Incapacitated)) and ATSIC (Community Development Employment Program data, at 30 June 1998).
Maps	As for Tables, above
Chapter 5	
Tables	
5.4 to 5.7	Compiled in HealthWIZ from data supplied by the ABS.
5.8 to 5.9	Data for **1988** from *A Social Health Atlas of Australia 1992* . Data for **1993** was compiled in HealthWIZ from data supplied by the ABS.
5.11 to 5.33	Data for **1985** to **1989** from *A Social Health Atlas of Australia 1992* . Data for **1992** to **1995** was compiled in HealthWIZ from data supplied by the Registrars of Deaths.
5.34 and 5.35	Compiled in HealthWIZ from data supplied by the ABS.
Figures	
5.3 to 5.7, 5.10	See note for Tables, above
Maps	As for Tables, above
Chapter 6	
Tables	
6.3, 6.5	With the exception of data for Queensland, data was compiled in HealthWIZ from data supplied by the AIHW from the National Hospital Morbidity Database: this database comprises data supplied to the AIHW by the State and Territory health authorities. Data for SLAs in Queensland were not available from the AIHW database and were obtained directly from the Queensland Health Department. The data was supplemented with details of the postcode or SLA of patients admitted to hospital in a State/Territory other than the State/Territory of their usual residence: these details were obtained from the individual State/Territory health authorities.
6.4	Data for **1989** (1989/90 for New South Wales) is from *A Social Health Atlas of Australia 1992* . With the exception of the data for same day patients which was from *NSW Inpatient Statistics Data Book 1989-90* for NSW and for South Australia was supplied by the Department of Human Services. Data for **1995/96**: see notes re Table 6.3, above, other than for data for same day patients which was supplied by the NSW Health Department and the South Australian Department of Human Services.
6.6, 6.7, 6.12 to 6.15, 6.18 to 6.23, 6.28 to 6.39, 6.59, 6.60	Data for **1989** is from *A Social Health Atlas of Australia 1992* . Data for **1995/96**: see notes re Table 6.3, above.
6.8 to 6.11, 6.16, 6.17, 6.24 to 6.27, 6.42 to 6.58, 6.61	Data for **1995/96**: see notes re Table 6.3, above.
6.63 and 6.66	Data for **1989** from *A Social Health Atlas of Australia 1992* . Data for **1996** was compiled in HealthWIZ from Medicare statistics supplied by DHAC.
6.67 and 6.68	Data was compiled in HealthWIZ from immunisation rates supplied from the Australian Childhood Immunisation Register by the National Centre for Immunisation Research and Surveillance of Vaccine at the New Children s Hospital, Westmead, New South Wales.
Figures	
6.1 to 6.10	See note for Table 6.3, above
Maps	As for Tables, above
Chapter 7	
Tables	
7.3 and 7.4	Data for **1990/91** from *A Social Health Atlas of Australia 1992* . Data for **1996/97** was compiled in HealthWIZ from Medicare statistics supplied by DHAC.
7.5 to 7.8	Data for **1989** from *A Social Health Atlas of Australia 1992* . Data for **1995/96** (public acute hospitals) and **1997** (private hospitals) was compiled in HealthWIZ from data supplied by DHAC.
7.2 and 7.9 to 7.12	Data for **1992** from *A Social Health Atlas of Australia 1992* . Data for **1997** was compiled in HealthWIZ from data supplied by DHAC.
Maps	As for Tables, above

Note: Details of abbreviations used in the table are ABS, Australian Bureau of Statistics; ATSIC, Aboriginal and Torres Strait Islander Commission; DFACS, Department of Family and Community Services; DHAC, Department of Health and Aged Care; DVA, Department of Veterans 'Affairs.

Appendix 1.4: Classification of deaths, admissions and procedures

Codes used

Causes of death are classified by the Australian Bureau of Statistics to the Ninth (1975) Revision of the World Health Organisation's International Classification of Diseases (ICD-9) which was adopted for world-wide use from 1979. The codes used for the variables mapped in Chapter 5 are listed in **Table A6**.

Diagnoses and procedures mapped in Chapter 6 are classified according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM October 1988 Revision). External causes are classified according to ICD-9-CM Supplementary Classification of External Causes of Injury and Poisoning (E'codes) classification codes. The codes used for the variables mapped in Chapter 6 are listed in **Table A7** and **A8**.

Table A6: ICD–9 Codes for causes of death mapped in Chapter 5

Cause of death	ICD code
All cancers [malignant neoplasms]	140-208
Lung cancer	162
Circulatory system diseases	390-459
Respiratory system diseases	460-519
Accidents, poisonings and violence	E800-E999

Table A7: ICD–9 Codes for diagnoses/external causes mapped in Chapter 6

Diagnoses /External cause	ICD code
Infectious and parasitic diseases	001-139
Cancers [malignant neoplasms]	140-208
Lung	162
Female breast	174
Psychiatric conditions	290-319
Psychoses	290-299
Neurotic, personality and other disorders	300-316
Circulatory system diseases	390-459
Ischaemic heart disease	410-414
Respiratory system diseases	460-519
Bronchitis, emphysema, asthma	490-493
Accidents, poisonings and violence	E800-E999

Table A8: ICPM Codes for surgical procedures mapped in Chapter 6

Principal procedures	Codes
All procedures	010-169; 180-695; 704-789; 792-793; 795-796; 798-869
Tonsillectomy and/or adenoidectomy	28.2, 28.3
Myringotomy [limited to 0-9 year olds]	20.01
Hysterectomy [limited females aged 30 years and over]	68.3-68.7
Caesarean section [limited to females aged 15 to 44 years]	74.0, 74.1, 74.2, 74.4; 74.99
Hip replacement	81.51, 81.53
Lens insertion	13.7
Endoscopies	42.23, 42.24, 44.13, 44.14, 45.13, 45.14, 45.16, 45.23-45.25

This page intentionally left blank

Appendix 1.5: Synthetic estimates for small areas

Staff of the Adelaide office of the Australian Bureau of Statistics (ABS) produced the synthetic predictions discussed and mapped in Chapter 5 as a consultancy for the Public Health Information Development Unit. The following paper prepared by the ABS describes the techniques used in production of the estimates.

Introduction

Statistics for small geographic regions are generally available only through administrative sources or the population census. Although household surveys contain much data of value, they provide estimates at a broad geographic level, usually the State or Territory level or, for some of the more populous States, for large regions. Estimates are rarely available for small areas such as the Statistical Local Area (SLA) mapped in this atlas.

Estimates produced from sample surveys are subject to two types of error: non-sampling errors which arise from errors in collecting, recording and processing the data; and sampling errors which arise because a sample, rather than the entire population, is surveyed. The sampling error tends to increase as the sample size decreases. Thus estimates produced from small samples can be subject to such high sample errors as to make them too unreliable for most practical purposes. Since household surveys typically have a small sample from large regions, it is not possible to provide direct survey estimates of suitable reliability for small regions.

Through the use of synthetic estimation techniques it is possible to produce reliable region level statistics (Marker 1999). The method of synthetic estimation was applied in predicting, at the SLA level, two characteristics from the 1995 National Health Survey (NHS):

- the number of people who had a self-assessed poor or fair health status; and
- the Physical Component Summary score from the SF-36 component of the NHS (see page 111 for details of this measure).

Predictions are also provided in this atlas of the number of people with a handicap; these estimates were produced by the ABS using a similar technique as part of another project. This technical note concentrates on the prediction of the former characteristics.

Background

Synthetic estimation predicts a value for a small geographic region based on modelled survey data and known characteristics of the region. A synthetic prediction can be interpreted as the expected value, for the variable of interest, for a 'typical' area with those characteristics. The SLA was the regional level of interest for this project (in the Australian Capital Territory and, in some cases in Queensland and the Northern Territory, SLAs were grouped; details of these groupings are contained in the relevant State and Territory atlases).

The model used for predicting small region data is determined by analysing data at a higher geographic level, in this case Australia. The relationship observed at the higher level between the characteristic of interest and predictor variables is assumed to also hold at the lower level. The predictions are made by applying the model to the small region counts of the predictors. This modelling technique can be considered as a sophisticated pro-rating of Australian level characteristic of interest across the regions in accordance with the joint distributions across the regions of the predictors.

The process of producing the predictions consists of four parts:

- preparation of data;
- model fitting;
- synthetic prediction; and
- assessing the prediction.

Data

As noted above, the two characteristics predicted were self-assessed health status and the Physical Component Summary score, both from the 1995 NHS. Self-assessed health status is provided by respondents to the survey indicating their assessment of the health status, on a scale of 'Excellent', 'Very Good', 'Good', 'Fair' or 'Poor'. The variables of interest here were those of people reporting their health as being 'Fair' or 'Poor'. The Physical Component Summary score is calculated from responses to the SF-36 component of the NHS. It is derived from a subset of items that ask respondents to the NHS aged 18 years and over, about their general physical health and wellbeing. A higher score indicates a better state of physical health and wellbeing.

Predictor data must satisfy the following criteria. It must be

- well related to the characteristic of interest;
- available from the NHS;
- available for similar time periods, both date and length of period; and be
- available at a similar geographic level, both Australia and SLA.

Sources of predictor data utilised were:

- the 1995 NHS;
- the 1996 Census of Population and Housing;
- administrative data from the Department of Family and Community Services;
- hospital separations data; and
- unreferred attendances with general medical practitioners (GPs).

One of the most important data related tasks was to identify predictors from these potential sources which satisfy the above criteria. Data considered included variables such as:

- age;
- sex;
- employment status;
- currently a student;
- income;
- receiving a Disability Support Pension;
- receiving Sickness Allowance;
- receiving the Age Pension;
- Socio-Economic Indexes for Areas derived from the Census;

- whether an inpatient at a hospital; and
- whether consulted with a GP in the two weeks prior to interview.

Many of the available variables common with the NHS differed by definition, collection methodology, reference period and geography. In such instances, appropriate adjustments were made using information obtained by comparing counts, proportions and distributions of the common variables. For example, the income variable was available to the nearest dollar from the NHS, but was available from the Census by income range only. This required the NHS income data to be classified to similar ranges. A comparison of the counts and distributions of persons across the income ranges indicated that income data from the NHS and Census were closely aligned and for the purposes of prediction could be considered well aligned. Several variables also required conversion of their geography from postcode to SLA using the 1994 Australian Standard Geographical Classification (ABS 1994).

There was, however, a fair degree of commonality in the datasets, with the NHS taken over the 1995 year, the hospital inpatient data being for 1995-96, pensioner and beneficiary data being at 30 June 1996 and the Population Census at 4 August 1996.

Model fitting

Once data preparation was completed the relationship between the characteristic of interest and the predictor variables was modelled using data from the NHS at the Australian level. The self-assessed health status and Physical Component Summary score were modelled independently.

The model applied took the linear form:

$$Y = p_o + p_1X_1 + p_2X_2 + p_3X_3 + ... + p_jX_j$$

where
Y is the characteristic of interest

X_i are the predictor variables

p_i are the coefficients which are produced from the modelling process.

In the case of the variable for self-assessed health status, the Y takes the value 1 if the individual's status was fair or poor and 0 otherwise. For the Physical Component Summary score, Y ranges in value from around 45 to 55.

The X_i predictors take the value 1 if the individual has the predictor characteristic (eg. has visited a GP in last two weeks) or 0 otherwise.

The coefficients, p_i, were estimated using the linear regression technique. An original subset of data items from the NHS were compiled that satisfied the specified criteria. The NHS data file, with the subset of data items, was randomly split into two halves with a regression model fitted to both data sets. Data items that were not important in predicting the variable of interest in either, or both, of the two models were removed. This process continued until a final linear model was obtained whereby all variables were significant ($p < 0.05$) in the estimation of the response variable (characteristic of interest). Fitting the model to the split data produces a more robust final model as it reduces the probability of including a variable with high variability.

The final form of the model was then fitted to the full data set to produce regression coefficients and diagnostics which were examined using Cook's D statistic (Cook 1979) to identify any individual respondent who had undue influence on the final parameter estimates. Any 'outliers' identified were removed from the data and the model refitted.

Below is a list of variables that were included in the final models.

Self-assessed health status:
- State/Territory of usual residence;
- age (in 10 year age groups);
- sex;
- employed;
- employed (aged 18 to 24 years);
- employed (aged 25 to 34 years);
- admitted to hospital for at least one night in the last two weeks;
- consulted a general medical practitioner in the last two weeks;
- receives Disability Support Pension;
- receives Disability Support Pension (aged 18 to 24 years);
- receives Sickness Allowance;
- receives Age Pension;
- SEIFA Index of Relative Socio-Economic Disadvantage.

Physical Component Summary score:
- State/Territory of usual residence;
- age (in 10 year age groups);
- income (gross personal annual income);
- studying (currently studying full or part-time at college, university, etc.);
- employed;
- admitted to hospital for at least one night in the last two weeks;
- consulted a general medical practitioner in the last two weeks;
- receives Disability Support Pension;
- receives Disability Support Pension (aged 18 to 24 years);
- receives Sickness Allowance;
- receives Age Pension;
- SEIFA Index of Relative Socio-Economic Disadvantage.

Synthetic prediction

The prediction for an SLA was derived from the linear combination, specified by the regression coefficients, of the counts of individuals within the SLA with the predictor characteristics.

Note that for the Physical Component Summary score the predicted value for the SLA was scaled to a person level score by dividing the prediction by the number of people aged 18 years and over. The final prediction can therefore be considered as a mean score for people living in the SLA.

The predictions of poor or fair health status give an indication of the number of persons aged 18 years and over who would assess their health as poor or fair.

The predictions were age-sex standardised to remove variations between SLAs solely related to variations in age and sex.

Assessing the predictions

The models were assessed in terms of how well they predicted for individuals, SLA and larger regions (Statistical Divisions and Sub-Divisions). This involved comparing predicted values against values determined directly from the NHS. For individuals, this was the reported value, while for SLA and larger regions it was the direct survey estimate. The comparisons were made by examining plots of the predictions against the NHS reported values and estimates. The plots were checked to ensure that there was a reasonable relationship between the predictions and NHS results.

The 95% confidence intervals were calculated for the direct survey estimates and compared to the predictions. If the majority of predictions fall within the confidence intervals then there is a high level of confidence that the predictions are reliable.

This page left intentionally blank

Appendix 1.6: Additional details of cluster analysis

Introduction

The descriptions of the cluster analyses for the towns were more lengthy and technical than the analyses for Queensland. A shortened version of the analysis is shown in Chapter 8 and the full version is shown below.

Socioeconomic status clusters of towns

A cluster analysis was undertaken for the 55 towns (urban centres) across Australia that had populations of 7,500 or more at the 1996 Census and were identifiable in the non-Census datasets (see Appendix 1.2 for further details). These 55 records are theoretically sufficient to carry out a cluster analysis with nine input variables. A cluster analysis was performed on the available data, and the solution examined before attempting more complicated techniques to find a solution. This analysis provided a three cluster solution of fair to average quality. It did not discriminate particularly well between clusters, and the High socioeconomic cluster did not perform particularly well against the IRSD.

The 55 records also provided enough information for an exploratory factor analysis, since this analysis has the same data requirements as the previous model. A factor analysis was attempted using principal components extraction and varimax rotation, and a reasonable three factor solution was produced by this analysis, although it did not discriminate particularly well on the input variables between clusters.

The two main drivers of each factor were entered into a cluster analysis. The analysis excluded dwellings with no vehicles, single parent families and female labour force participation. This produced a three cluster solution which performed well against the IRSD, but again did not discriminate particularly well on the input variables between clusters.

The drivers of the first factor (low income families, unemployed people, female labour force participation and dwellings with no motor vehicle) were entered into a cluster analysis. This produced a four factor solution of poor quality.

A second exploratory factor analysis was tried using all nine input variables, but this time using maximum likelihood extraction, and oblimin (oblique, ie. not orthogonal) rotation. This analysis gave a three factor solution with the same factors (although in a different order, and the variables were in a different order of importance to the solution). The two main drivers of each factor were entered into a cluster analysis. The analysis excluded dwellings rented from the State/Territory housing authority, single parent families and female labour force participation. This analysis produced a four factor solution of good quality, although again the solution did not discriminate between clusters.

The drivers of the first factor of the oblique factor solution (dwellings rented from the State housing authority, Indigenous people and single parent families) were entered into a cluster analysis. This analysis produced a three factor solution (with Broome ungrouped) which was of only fair quality.

The best solution was felt to be the four cluster solution produced from the first two factor drivers of each factor of the oblique factor solution (ie. based on low income families, unemployed people, early school leavers, unskilled and semi-skilled workers, Indigenous people and single parent families). This analysis produced a solution of acceptable quality, which is reproduced in **Table 8.7**.

The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was also available for the specified towns, but was withheld from the analysis and used as an independent check on the solution. It was found that, of the bottom 17 towns as classified by the IRSD, 16 (94.1 per cent) were classified to the Low socioeconomic group in this analysis. Further, of the top 20 towns under the IRSD, 15 (75.0 per cent) were classified to the High socioeconomic group.

Health status clusters of towns

There were 15 variables to analyse 55 records. This was not quite enough data. A cluster analysis of all the above variables was tried to see if it gave a sensible solution despite the lack of data. This produced a clear two cluster solution of good quality. The solution did not perform particularly well against the IRSD however, and a two cluster solution is not optimal.

Alternative strategies were tried in an attempt to produce a better solution. An exploratory factor analysis was run on the data using Principal Component extraction and orthogonal (varimax) rotation. The analysis produced a six factor solution. It should be noted that there was not enough data to sustain a factor analysis either.

The drivers of the factor solution were selected for entry into a cluster analysis. The first two drivers of the first two factors (deaths of 15 to 64 year old females, and deaths of 15 to 64 year olds from cancer, lung cancer and accidents, poisonings and violence) and the first drivers of the other four factors (people with a handicap, the Physical Component Summary score, infant deaths and the Total Fertility Rate) were chosen. They were entered into a cluster analysis, which produced a three cluster solution of good quality. Again the solution did not perform all that well against the IRSD.

The four drivers of the first factor (deaths of 15 to 64 year old females, deaths of 15 to 64 year olds from respiratory system diseases and accidents, poisonings and violence and years of potential life lost) were entered into a cluster analysis. This again produced a three factor solution which was very similar to the one produced based on the previous set of factor drivers (although slightly inferior to it).

The six factor scores saved from the above analysis were input into a cluster analysis. This produced a three cluster solution of good quality. The clusters were better spread than in other

solutions, and the solution performed better against the IRSD than other solutions (**Table 8.7**).

The IRSD was again used as an independent check on the solution. It was found that, of the bottom 12 towns as classified by the IRSD, five (41.7 per cent) were classified to the Poor health status group in this analysis. Further, of the top 22 towns under the IRSD, 14 (63.6 per cent) were classified to the Good health status group.

Health service utilisation clusters of towns

There were 30 variables to analyse 55 records. This was not enough data. A cluster analysis of all the above variables was tried to see if it gave a sensible solution despite the lack of data. This produced a three cluster solution of reasonable quality.

Alternative strategies were tried in an attempt to produce a better solution. An exploratory factor analysis was run on the data using Principal Component extraction and orthogonal (varimax) rotation. The analysis produced an eight factor solution, but the varimax rotation failed to converge. Examination of the scree plot led to the conclusion that the factor analysis should only have six factors. This solution was forced, and the rotation then converged. It should be noted that there was not enough data to sustain a factor analysis either.

The drivers of the factor solution were selected for entry into a cluster analysis. The first two drivers of the first three factors (total admissions, same day admissions, admissions of females, same day admissions for a surgical procedure, and GP services for males and females) and the first drivers of the other three factors (admissions to a private hospital, and admissions for breast cancer and hip replacement) were chosen. They were entered into a cluster analysis, which produced a three cluster solution of reasonable quality (similar to the quality of the first solution examined).

The first nine drivers of the first factor (total admissions, admissions to a public hospital, admissions of males and females, and admissions for infectious diseases, respiratory system diseases and respiratory system diseases of children aged 0 to 4 years) were entered into a cluster analysis. The solution contained two clusters but was of a lower quality than the original solution.

The six factor scores saved from the above analysis were input into a cluster analysis. This produced a three cluster solution of good quality. The clusters were better spread than in other solutions, and the solution performed better against the IRSD than other solutions (**Table 8.7**).

A check with the IRSD showed that, of the bottom ten towns as classified by the IRSD, three (30.0 per cent) were classified to the High health service use group in this analysis. Further, of the top 26 towns under the IRSD, 13 (50.0 per cent) were classified to the Low health service use group.

Social health status clusters of towns

The cluster analysis technique has also been applied to a combination of the socioeconomic status and health status data sets. Data considered for inclusion were the variables in the final models for towns used to examine socioeconomic status and health status.

There were 24 variables to analyse 55 records. This was clearly not enough data. A cluster analysis of all the above variables was tried to see if it gave a sensible solution despite the lack of data. This produced a three cluster solution of fair to average quality. The solution did not perform at all well against the IRSD for the Low status group, and lacked definition between the Medium and Low status groups.

Alternative strategies were tried in an attempt to produce a better solution. An exploratory factor analysis was run on the data using Principal Component extraction and orthogonal (varimax) rotation. The analysis produced a six factor solution. It should be noted that there was not enough data to sustain a factor analysis either.

The drivers of the factor solution were selected for entry into a cluster analysis. The first three drivers of the first factor (deaths of 15 to 64 year old males, deaths of 15 to 64 year olds from accidents, poisonings and violence and years of potential life lost), the first two drivers of the second to fourth factors (single parent families, unskilled and semi-skilled workers, unemployed people, people with a handicap or disability and the Physical Component Summary score) and the first drivers of the last two factors (dwellings rented from the State housing authority and infant deaths) were chosen. They were entered into a cluster analysis, which produced a three cluster solution of only fair quality. Again the solution lacked discrimination between the middle and low status groups.

The eleven drivers of the first factor (the Indigenous population, deaths of 15 to 64 year old males and females, deaths of 15 to 64 year olds from cancer, lung cancer, circulatory system diseases, respiratory system diseases and accidents, poisonings and violence, deaths of 15 to 24 year olds from accidents, poisonings and violence, years of potential life lost and Total Fertility Rate) were entered into a cluster analysis. This again produced a three factor solution which was of very similar quality to the original one based on all input variables (although slightly superior to it).

The six factor scores saved from the above analysis were input into a cluster analysis. This produced a four cluster solution of poor quality.

An exploratory factor analysis was run on the data using Maximum Likelihood extraction and oblique (oblimin) rotation. This produced a six factor solution.

The drivers of the factor solution were selected for entry into a cluster analysis. The first two drivers of the first four factors (dwellings rented from the State housing authority, people reporting fair or poor health, the Physical Component Summary score, people with a handicap or disability, deaths of 15 to 64 year old males and females and deaths of 15 to 64 year olds from cancer), and the first drivers of the last two factors (the Indigenous population and single parent families) were chosen. They were entered into a cluster analysis, which produced a three cluster solution of only fair quality. Again the solution lacked discrimination between the Middle and Low status groups.

The eight drivers of the first factor (the Indigenous population, deaths of 15 to 64 year old males, deaths of 15 to 64 year olds from cancer, lung cancer, circulatory system diseases, respiratory system diseases, accidents, poisonings and violence, deaths of 15 to 24 year olds from accidents, poisonings and

violence, years of potential life lost and Total Fertility Rate) were entered into a cluster analysis. This again produced a three factor solution which was identical to the three cluster solution produced using the factor drivers of the first factor of the principal components extraction/varimax rotation factor analysis.

The six factor scores saved from the above analysis were input into a cluster analysis. This produced a three cluster solution of reasonable quality, with Charters Towers (C) not grouped. The clusters were better spread than in other solutions, and the solution performed better against the IRSD than other solutions. It is accepted since it was the best alternative found (**Table 8.7**).

Of the 17 lowest towns for the IRSD, nine (52.9 per cent) were classified to the Low social health status cluster; and of the top 14 towns for the IRSD, seven (50.0 per cent) were classified to the High social health status cluster.

This page left intentionally blank