8 Statistical analysis

Introduction

Two sets of analyses have been undertaken to illustrate the extent of association between areas with low socioeconomic status and poor health. Correlation coefficients have been produced to indicate interdependence between the measures of socioeconomic status, health status and use of health services. Cluster analysis has been undertaken to indicate the extent to which areas display significantly similar characteristics from among the chosen measures of socioeconomic status, health status and use of health services.

Inequalities in health have traditionally been indicated by an approximation to social class, frequently based on a categorisation of occupations. The other major indicators traditionally used have included income, education, ethnicity and employment status (which allows for the inclusion of unemployed people and those not in the labour force). The measures of socioeconomic status included in this analysis include income, education, occupation, labour force status and Aboriginality.

Correlation analysis

Description

Correlation is the degree to which one variable is statistically associated with another. The correlation coefficient is a measure of the strength of this association. When high values for one variable are matched by high values for the other (or when low values are matched by low values), then they are positively correlated. Where the interdependence is inverse (ie. high values for one are matched by low values for the other), the two variables are negatively correlated.

Methods

The Pearson product-moment correlation (r) has been used in this analysis to indicate the degree of correlation between pairs of variables. Pearson correlation coefficients range from +1 (complete positive correlation) through 0 (complete lack of correlation) to –1 (complete negative correlation). As a general rule, correlations of plus or minus 0.5 or above are considered to be of meaningful statistical significance. Correlations of plus or minus 0.71 or above are of substantial statistical significance, because this higher value represents at least 50 per cent shared variation (r^2 greater than or equal to 0.5).

Correlation coefficients were calculated by comparing the value (expressed as a percentage or as a standardised ratio) for each variable in each SLA with the value of each of the other variables. Correlation coefficients are generally referred to as being, for example, 'a correlation of low income families with the *paired* variable of hospital admissions of females'. However, to promote ease of reading where many correlation coefficients are quoted in the text, the word 'paired' has been omitted. For similar reasons the symbol used to indicate a correlation coefficient (r) has been omitted.

Two measures of socioeconomic status included in the analysis in this section have not been mapped. They are families receiving an income of $52,000 or more per annum and people in occupations classified as 'Managers and administrators' and 'Professionals'. These two measures were included as they indicate high socioeconomic status, in contrast to most other measures, which were chosen because they indicate low socioeconomic status.

The results of the correlation analysis, which was undertaken separately for **Adelaide** and the rest of the State, are shown in the following tables: coefficients of from 0.5 to 0.7 and from 0.71 to 1 (both positive and negative) are highlighted in the tables, and are referred to in the individual map commentaries, as appropriate.

When discussing the results of the correlation analysis in the text, mention is often made of 'the indicators of socioeconomic disadvantage'. This reference is to variables such as those for single parent families, unemployed people, Indigenous people and housing authority rented dwellings. References to 'high socioeconomic status' reflect the variables for high income families, female labour force participation and managers and administrators and professionals.

The associations discussed in the text are, in general, limited to associations between the variable under discussion and the indicators of socioeconomic status from Chapter 3. This approach is largely a response to the limited space available for comment. The extent of any association with the other variables analysed can be ascertained from an examination of the correlation matrices (**Table 8.1** and **8.2**).

Results

Adelaide

There were correlations of significance at the SLA level between the measures of socioeconomic disadvantage and a number of the health status variables. The strongest of these were with the variables for people reporting their health as fair or poor (as opposed to those reporting their health as being excellent, very good, or good); the PCS (the Physical Component Summary, a measure of physical health); the handicap status of the population; and premature death from, in particular, circulatory system diseases (**Table 8.1**). Similarly, strong associations were also evident in the correlation analysis with the health service use variables of GP services to males and females; and of admissions for circulatory and respiratory system diseases, and admissions to a public hospital.

Non-metropolitan areas

SLAs in non–metropolitan areas range in size from an estimated 6 square kilometres in the Municipality of Peterborough to 670,376 in Unincorporated Far North. They also range from sparsely populated rural and remote areas to large country towns. Despite these wide variations, the correlation analysis has been produced: the results are presented in **Table 8.2**.

It is clear from the matrix of correlation coefficients that there are fewer correlations of significance at the SLA level in the non-metropolitan areas of South Australia than was the case in **Adelaide**. This is, in part, a result of the number of SLAs with

relatively small numbers of cases (population, deaths, hospital admissions, etc.) which reduces the strength of the analysis.

However a number of variables are highly correlated with each other: these are the variables for unemployed people, Indigenous Australians, single parent families, people born in non-English speaking countries, people with poor proficiency in English and dwellings without a motor vehicle.

Various sub-sets of these are correlated with measures of health status and use of health services. The strongest correlations with the measures of socioeconomic disadvantage were with the variables for people reporting their health as fair or poor, the PCS and people with a handicap.

Although generally weaker, there was a consistent association between socioeconomic disadvantage and the variables for hospital admissions of males and females; and hospital admissions from circulatory and respiratory system diseases.

Table 8.1: Correlation matrix for SLAs in Adelaide

Refer to file: ch8 correlation matrices

Table 8.1: Correlation matrix for SLAs in Adelaide ...*cont*

Refer to file: ch8 correlation matrices

Table 8.2: Correlation matrix for SLAs in the non-metropolitan areas of South Australia

Refer to file: ch8 correlation matrices

Table 8.2: Correlation matrix for SLAs in the non-metropolitan areas of South Australia ...*cont*

Refer to file: ch8 correlation matrices

Cluster analysis

Description

The intention of the cluster analysis is to produce summary measures of socioeconomic status, health status and health service use at the SLA level. It is useful to have this information, as the SLA is an important administrative and planning unit. However, the production of clusters at this level is problematic, as SLAs are often large, heterogeneous areas, and their average values sometimes disguise a wide range of sub-area variation in the values of the population characteristics under analysis.

It should also be noted that cluster analysis is an exploratory technique and, as with all such techniques, the real test of a solution is whether it makes any sense. Decisions as to the variables to be used, or the number of clusters in a solution, all impact on the final result.

The results of the cluster analysis, therefore, represent indicative groupings of areas with broadly similar characteristics among the variables analysed in each set. They will be a useful tool for some purposes: on other occasions, however, the individual variables on which they are based may also be relevant.

Methods

Cluster analysis (using the squared Euclidean measure) was undertaken by the Ward's method. This (hierarchic) clustering method seeks to partition a set of objects (eg. postcodes or, in this case, SLAs) into a set of non-overlapping groups so as to maximise some external criterion of 'goodness of clustering', typically the extent to which the within-cluster inter-object similarities are maximised and the between-cluster similarities minimised.

In cluster analysis, 10 records (ie. SLAs) per variable is considered desirable, with an absolute minimum of five. Had all the datasets been used in the analysis there would have been many fewer than this. A variety of techniques was used to attempt to overcome this problem, including applying a factor analysis or undertaking an experimental fit of the full data set, and using the results to reduce the number of variables included in the final analysis.

Table 8.3 lists the variables used in the analysis. The analysis was undertaken separately for **Adelaide** and the rest of the State. The datasets used in the cluster analysis (based on boundaries in existence from 1991 to 1997) were aggregated to a common set of boundaries (1996). Where the areas differ from the 1996 boundaries, the variations are noted in the text.

Table 8.3: Variables used in cluster analysis

Socioeconomic status
- % single parent families
- % low income families
- % unskilled or semi-skilled workers
- % unemployed
- % female labour force participation
- Standardised Ratio for people who left school at age 15 or earlier, or who did not attend school
- % Aboriginal & Torres Strait Islander people
- % Housing authority rented dwellings
- % Dwellings without a motor vehicle

Health status
- ***Self-reported health status***
- ***Physical Component Summary score [SF-36]***
- ***Disability and handicap status*** (Standardised Ratio)
  - with a disability
  - with a handicap
- ***Deaths*** (Standardised Death Ratio)
- Infant deaths
- Deaths
  - of males aged 15-64 years, from all causes
  - of females aged 15-64 years, from all causes
  - of persons aged 15-64 years
    - from cancer
    - from circulatory system diseases
    - from respiratory system diseases
    - from accidents, poisonings & violence
  - of persons aged 15-24 years
    - from accidents, poisonings & violence
- Years of potential life lost as a result of deaths at ages 15-64 years
- ***Total Fertility Rate***

Utilisation of health services
- ***Hospital admissions*** (Standardised Admission Ratio)
  - to public acute hospitals
  - to private acute & private psychiatric hospitals
  - to public acute & private hospitals, admissions
    - total admissions
    - of males
    - of females
    - for infectious diseases
    - for all cancers
    - for lung cancer
    - for breast cancer for women aged 40 years or more
    - for psychoses
    - for neuroses
    - for circulatory system diseases
    - for ischaemic heart disease
    - for respiratory system diseases
    - for respiratory system diseases in 0 to 4 year old children
    - for bronchitis, emphysema & asthma
    - from accidents, poisonings and violence
    - for all surgical procedures
    - for all surgical procedures as same day admission
    - for tonsillectomy and/or adenoidectomy
    - for myringotomy in children aged 0-9 years
    - for Caesarean sections in women aged 15-44 years
    - for hysterectomy in women aged 30 years and over
    - for hip replacements
    - for lens insertion in people aged 50 years or more
    - for endoscopy
- ***General medical practitioner services*** (Standardised Ratio)
  - for males
  - for females
- ***Children fully immunised at 12 months***

Results

Socioeconomic clusters in Adelaide

Variables considered for inclusion were those listed in **Table 8.3** under the heading *Socioeconomic status*. The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was also used in the analysis, as an independent check on the solution.

Although a number of other variables were available for analysis, previous experience (Glover, 1996) has shown that the inclusion of variables regarding non-English speaking background is not beneficial to the analysis. The congregation of persons of the same ethnic group does not necessarily indicate a pocket of disadvantage. Although on average we may expect these variables to also show higher levels in disadvantaged areas, their inclusion in the cluster analyses does not assist in the search for viable and sensible solutions.

The variables relating to people born in predominantly non-English speaking countries (and their proficiency in English) were accordingly dropped from the analysis, leaving nine variables for inclusion. There are 30 SLAs in **Adelaide**. (excluding Unincorporated Western, an SLA with a population of under 100 people). These 30 records are not theoretically sufficient to carry out a cluster analysis with nine input variables. However, the acid test of a cluster analysis is whether the solution is interpretable, and it is still possible for an analysis to provide an interpretable solution even when there is a shortage of input records. Accordingly, a cluster analysis was performed on the available data, and the solution examined before attempting more complicated techniques to find a solution.

Problems of scale can affect the analysis as more common data items will dominate the solution. To avoid these problems, the variables were standardised and the resultant z scores were entered into the cluster analysis.

In this case the analysis provided a very crisp three cluster solution, as below (see **Table 8.4** and **Map 8.1**). The three clusters have been labelled as High (20 SLAs), Medium (eight SLAs), Low (two SLAs) socioeconomic status clusters.

Although, as noted above, theoretically there is insufficient data to justify the model, the solution is so good it should be accepted (ie. the end justifies the means). This is supported by a comparison with the IRSD. This comparison showed that the two SLAs with the lowest IRSD scores in **Adelaide** (Elizabeth (C) and Enfield (C) Part B) formed the Low socioeconomic status group and that 19 of the 20 SLAs with the highest scores for the IRSD were classified to the High socioeconomic status group.

Table 8.4: Composition of SLA clusters in Adelaide

SLA	Socioeconomic status	Health status	Health service utilisation	Social health[1]
Adelaide (C)	High	Poor	Medium	Medium
Brighton (C)	High	Medium	Medium	Medium
Burnside (C)	High	Good	Low	High
Campbelltown (C)	High	Medium	Medium	Medium
East Torrens (DC)	High	Good	Low	High
Elizabeth (C)	Low	Poor	High	Low
Enfield (C) [Part A]	Medium	Poor	Medium	Low
Enfield (C) [Part B]	Low	Poor	Medium	Low
Gawler (M)	Medium	Medium	High	Medium
Glenelg (C)	High	Poor	Medium	Medium
Happy Valley (C)	High	Good	Medium	High
Henley and Grange (C)	High	Medium	Low	Medium
Hindmarsh and Woodville (C)	High	Medium	Medium	Medium
Kensington and Norwood (C)	High	Medium	Low	Medium
Marion (C)	High	Medium	Medium	Medium
Mitcham (C)	High	Good	Medium	High
Munno Para (C)	Medium	Poor	High	Low
Noarlunga (C)	Medium	Medium	High	Medium
Payneham (C)	High	Medium	Low	Medium
Port Adelaide (C)	Medium	Poor	Medium	Low
Prospect (C)	High	Medium	Low	Medium
St Peters (M)	High	Poor	Medium	Medium
Salisbury (C)	Medium	Medium	High	Medium
Stirling (DC)	High	Good	Low	High
Tea Tree Gully (C)	High	Good	Medium	High
Thebarton (M)	Medium	Poor	Low	Low
Unley (C)	High	Medium	Medium	Medium
Walkerville (M)	High	Medium	Low	Medium
West Torrens (C)	High	Medium	Medium	Medium
Willunga (DC)	Medium	Good	High	Medium

[1] **Social health 'clusters were produced by a joint analysis of the socioeconomic status and health status variables**

Health status clusters in Adelaide

The data variables available for this analysis were the variables of premature death, disability and handicap status, the Total Fertility Rate and the two synthetically predicted estimates from the 1995 National Health Survey (the Physical Component Summary and the measure of fair/poor health).

With the exception of the Infant Death Rate (shown as the number of deaths per 1,000 live births), all of the variables were represented by age-sex standardised ratios. Missing data values (where there were fewer than five cases for any SLA and a standardised ratio was not calculated) were substituted by zero. Legitimate zero coded values remained as zero.

There were 14 variables to analyse 30 records. Clearly this was not enough data. However, 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 clean three cluster solution of good quality, which was accepted without further investigation (**Table 8.4** and **Map 8.2**).

Note that the Poor Status group did have higher status than the Good Status group for two variables (Total Fertility Rate and disability). These results are understandable, in that females in socioeconomically disadvantaged areas have higher Total Fertility Rates; and that disability rates are higher in both socioeconomically disadvantaged areas and areas with high proportions of boarding houses and sheltered and other forms of specialist accommodation.

A check with the IRSD found that, of the bottom nine SLAs for **Adelaide** (as classified by the IRSD), six (66.7 per cent) were classified to the Poor health status group in this analysis. Further, of the top seven SLAs under the IRSD, five (71.4 per cent) were classified to the Good health status group.

Health service utilisation clusters in Adelaide

All but one of the variables in this data set were represented by age-sex standardised ratios: the immunisation variable is of the proportion of children fully immunised at one year of age. Missing data values (SLAs where eg. fewer than five hospital admissions were predicted from the Australian rates) were substituted by zero. Legitimate zero coded values remained as zero.

There were 29 variables to analyse 30 records. Clearly this was not enough data and alternative strategies were tried in an attempt to produce a useful solution.

These strategies are described in Appendix 1.6. The result of the detailed analysis was a reasonably clean three factor solution, which was defensible although not as clean as the previous two cluster solution. In this solution the Low service use cluster was still higher than the High service use cluster on a few variables (lens, hip, endoscopy and immunisation). These discrepancies mainly look capable of being explained by wealth and/or age profiles. Also, it did seem sensible for the High service use cluster to consist mainly of the more outlying northern and southern areas of **Adelaide**.

Since this solution is based on six variables analysing 30 records, it does not have the same validity concerns attached to the previously tried methods. Also the solution is of acceptable quality. It was therefore accepted, and is reproduced below (**Table 8.4** and **Map 8.3**).

A check with the IRSD showed that, of the bottom six SLAs for **Adelaide** as classified by the IRSD, three (50.0 per cent) were classified to the High health service use group in this analysis. Further, of the top nine SLAs under the IRSD, four (44.4 per cent) were classified to the Low health service use group.

Social health status clusters in Adelaide

The cluster analysis technique has also been applied to a combination of the socioeconomic status and health status data sets. The results of the cluster analysis for the combination of these data sets may be useful as a summary indicator of the 'social health' status of the population of each grouping of SLAs.

Data considered for inclusion were the demographic variables in the final model for SLAs in **Adelaide**, used to examine socioeconomic status, and the health status variables used in the final health status model. The variables excluded from the health status model because of missing data were excluded from this model also.

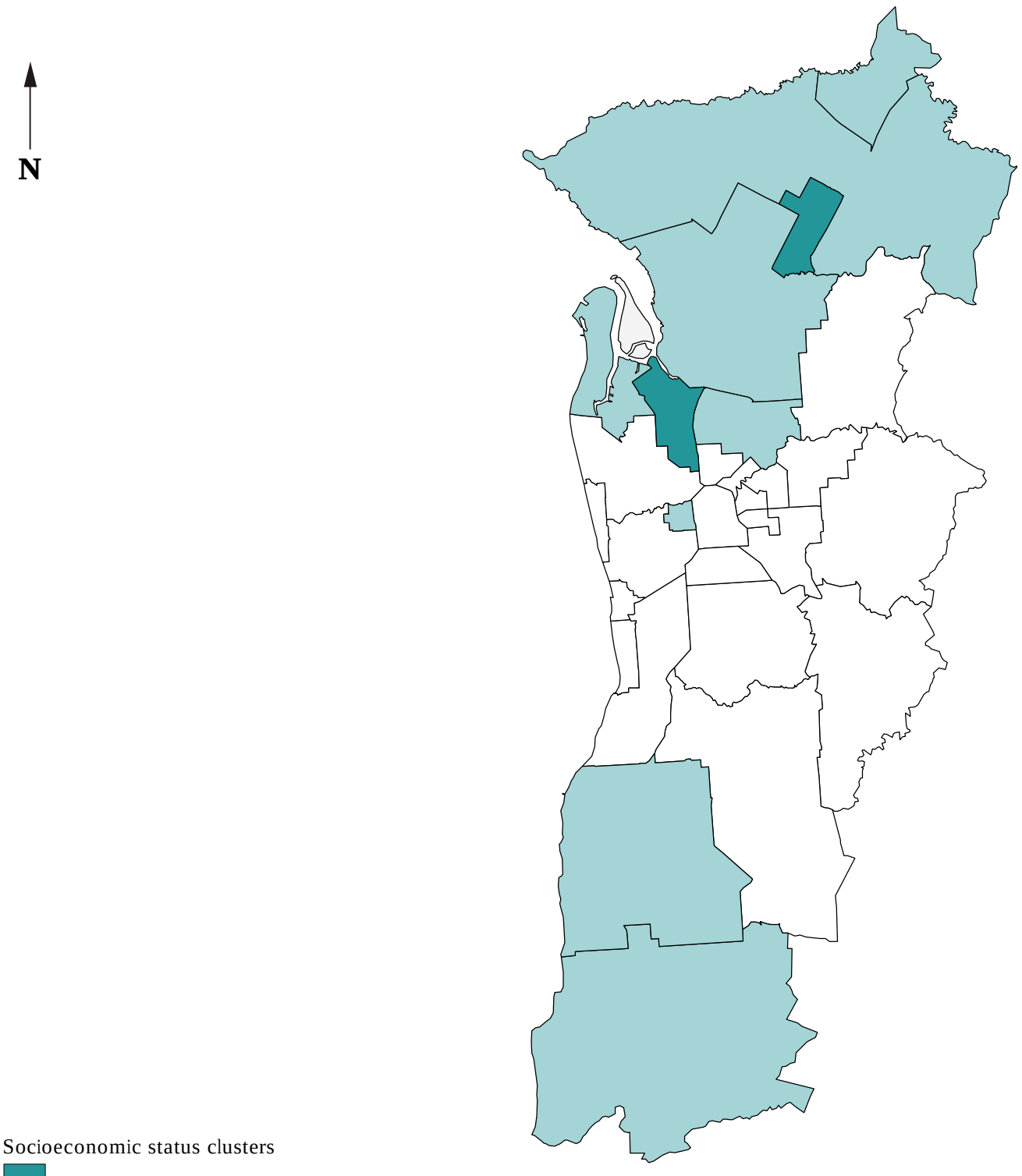
A cluster analysis of all the above variables was tried to see if it gave a sensible solution despite the lack of data. This produced a very clean three cluster solution of good quality, which was accepted without further investigation. The SLAs in each cluster are listed in **Table 8.4** and shown in **Map 8.4**.

The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was also available for the specified SLAs, but was withheld from the analysis and used as an independent check on the solution. It was found that, of the bottom six SLAs for **Adelaide** as classified by the IRSD, five (83.3 per cent) were classified to the Low social health status group in this analysis. Further, of the top six SLAs under the IRSD, five (83.3 per cent) were classified to the High social health status group.

Map 8.1

Socioeconomic status clusters based on Statistical Local Areas, Adelaide

clusters of SLAs with generally similar socioeconomic status characteristics

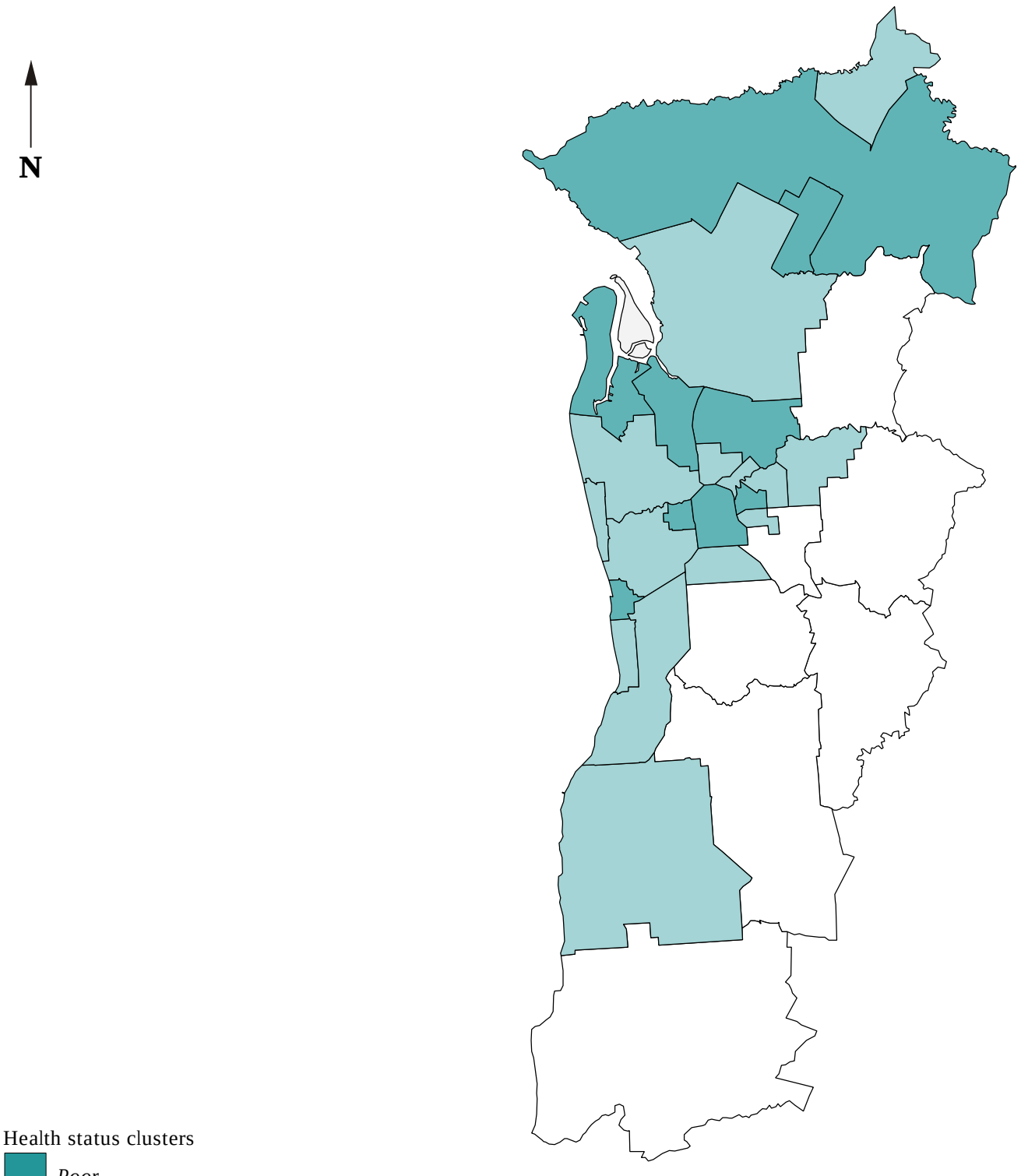


Source: Compiled from project sources

Details of map boundaries are in Appendix 1.2

National Social Health Atlas Project, 1999

Map 8.2
Health status clusters based on Statistical Local Areas, Adelaide
clusters of SLAs with generally similar health status characteristics



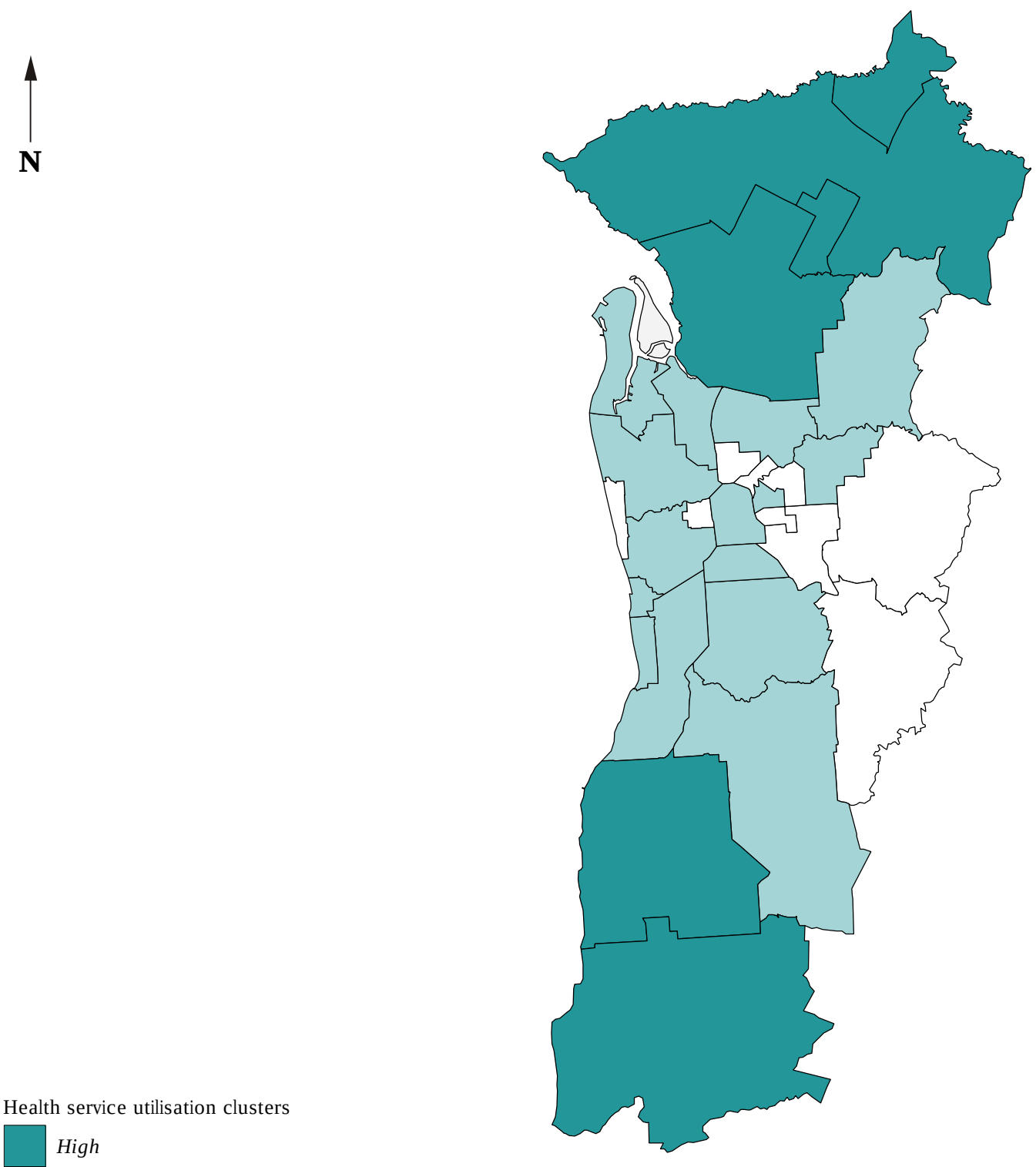
Source: Compiled from project sources

Details of map boundaries are in Appendix 1.2

National Social Health Atlas Project, 1999

Map 8.3
Health service utilisation clusters based on Statistical Local Areas, Adelaide

clusters of SLAs with generally similar health service utilisation characteristics

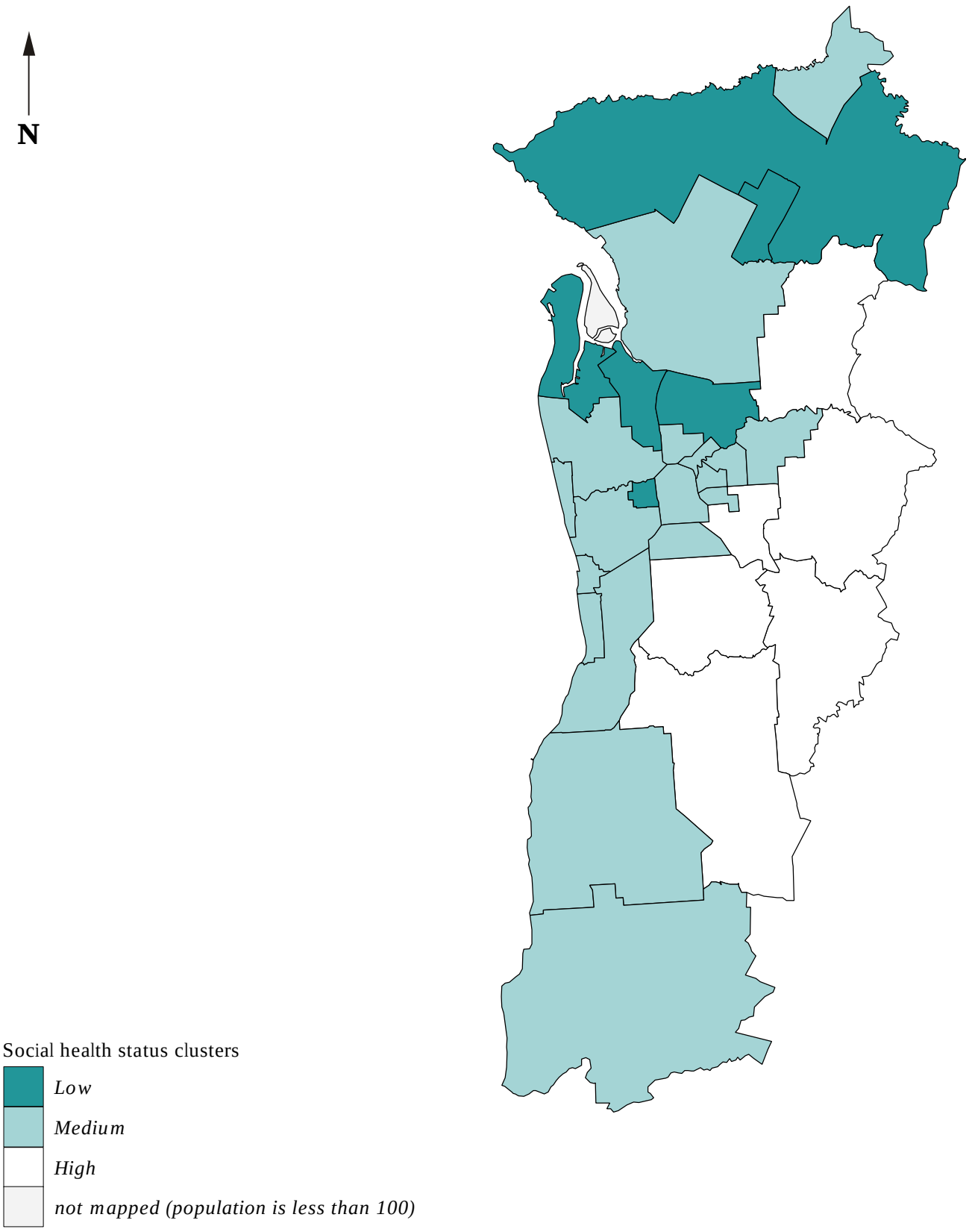


Source: Compiled from project resources

Details of map boundaries are in Appendix 1.2

Map 8.4
Social health status clusters based on Statistical Local Areas, Adelaide

clusters of SLAs with generally similar social health status characteristics



Source: Compiled from project sources

Details of map boundaries are in Appendix 1.2

National Social Health Atlas Project, 1999

Socioeconomic clusters of SLAs in non-metropolitan areas

The production of clusters at the SLA level in the non-metropolitan areas is even more problematic (than for **Adelaide**), with SLAs varying enormously in size and composition. For example, large urban centre SLAs such as Whyalla (C) and Mount Gambier (C) (population 23,647 and 22,037 respectively) stand in contrast to rural SLAs such as Unincorporated Riverland (population 166) and Carrieton (156). Unincorporated Far North, the SLA with the largest land area, occupies just over two thirds of South Australia's land mass yet has a population of only 6,273. Aboriginal people, generally the most disadvantaged population group, are unevenly distributed throughout these SLAs, from as high as 68.4 per cent of the total population in Unincorporated Riverland, 36.4 per cent in Unincorporated Far North and 34.4 per cent in Unincorporated West Coast to less than one per cent in over half (58.8 per cent) of the State's non-metropolitan SLAs.

There were data for 95 SLAs across South Australia. These records are ample to carry out a cluster analysis with nine input variables. A cluster analysis was performed on the available data, and the solution examined. The analysis produced a clean three cluster solution. Since the solution was of good quality, it was accepted and is reproduced in **Table 8.5** and **Map 8.5**.

The Low socioeconomic status cluster is comprised of a mix of rural areas and towns, including the State's largest regional centres of Port Pirie (C), Murray Bridge (DC), Port Augusta (C), Whyalla (C), Port Lincoln (C) and Mount Gambier (C). SLAs in the High socioeconomic status cluster are grouped in a number of locations, and include areas adjacent to **Adelaide**, in the Riverland, in the south-east and the mid north.

Of the 25 SLAs with the lowest scores for the IRSD, 17 were classified to the Low socioeconomic status cluster; and of the top 33 SLAs for the IRSD, 24 were classified to the High socioeconomic status cluster.

Health status clusters of SLAs in the non-metropolitan areas

The variables for infant deaths; deaths of 15 to 64 year olds from lung cancer, diseases of the respiratory system and accidents, poisonings and violence; and deaths of 15 to 24 year olds from the external causes of accidents, poisonings and violence were excluded from the analysis because five per cent or more of SLAs had no cases. Unincorporated Yorke, Unincorporated Murray Mallee and Unincorporated Lincoln were excluded from the analysis due to the small number of cases. Thus there were 10 variables to analyse 95 records.

A cluster analysis of all the above variables was tried to see if it gave a sensible solution. It resulted in a three cluster solution of good quality, although it did not discriminate at all well between the Medium and Poor health status clusters. Alternative strategies were tried in an attempt to produce a useful solution. These strategies are described in Appendix 1.6. From previous experience with this dataset, it was likely that the best solution would be produced by the factor drivers of a factor solution produced by a Principal Components extraction with a varimax rotation. This analysis produced a three factor solution.

The drivers of the factor solution (years of potential life lost, Physical Component Summary score and deaths of males aged 15 to 64 years) were selected for entry into a cluster analysis, giving three variables for analysis on 95 cases.

This produced a three factor solution of ordinary quality, which did not discriminate well between the Medium and Good health status groups.

The drivers of the first factor of the above factor analysis (people reporting fair or poor health, the Physical Component Summary score, people with a handicap and people with a disability) were entered into a cluster analysis. This produced a three cluster solution of poor quality.

A factor analysis was attempted using maximum likelihood extraction and oblimin rotation. It failed to converge at iteration 15.

The cluster solution produced first using all variables was the best solution. Although this solution is fairly ordinary in quality, it is the best solution found, and was therefore accepted. The SLAs in each cluster are listed in **Table 8.5** and shown in **Map 8.6**. Note that the Poor Status group had higher status than the Good Status group for disability.

The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was again used as an independent check on the solution. It was found that, of the bottom 12 SLAs for the non-metropolitan SLAs in South Australia as classified by the IRSD, 7 (58.3 per cent) were classified to the Poor health status group in this analysis. Further, of the top 21 SLAs under the IRSD, 11 (52.4 per cent) were classified to the Good health status group.

Health service utilisation clusters of SLAs in the non-metropolitan areas

Initial attempts to produce a solution were not successful and alternative strategies were tried. These strategies are described in Appendix 1.6.

The result of the analysis was a choice between a two cluster solution using 9 variables and a three cluster solution using 18 variables. In the 18 variable three cluster solution, the Low service use cluster had higher use of private hospital services than the High service use cluster, and higher immunisation rates. For all other variables the High service use cluster had higher use of services than the Low service use cluster. In the 9 variable, two cluster solution the situation was the same, except that the Low service use cluster also had higher rates of hip replacement than the High service use cluster. Because the three cluster solution improves on randomness more than the two cluster solution, and a three cluster solution is preferred aesthetically, it is the solution accepted. The SLAs in each cluster are listed in **Table 8.5** and shown in **Map 8.7**.

There was moderate agreement with the IRSD: of the lowest 14 SLAs for the IRSD, six (42.9 per cent) were classified to the High health service use cluster; and of the highest 37, 20 (54.1 per cent) were classified to the Low health service use cluster.

Social health status clusters of SLAs in the non-metropolitan areas

Data considered for inclusion were the demographic variables in the final model for SLAs in the non-metropolitan areas of South Australia used to examine socioeconomic status, and the health status variables used in the final health status model. The variables excluded from the health status model because of missing data were excluded from this model also. Thus there were 17 variables to analyse 95 records (SLAs). Clearly this was enough data.

A cluster analysis of all the above variables was tried to see if it gave a sensible solution. It resulted in a three cluster solution of good quality. The solution was therefore accepted and the SLAs in each cluster are listed in **Table 8.5** and shown in **Map 8.8**.

Of the 28 lowest SLAs for the IRSD, 22 (78.6 per cent) were classified to the Low social health status cluster; and of the top 67 SLAs for the IRSD, 61 (91.0 per cent) were classified to the High social health status cluster.

Table 8.5: Composition of SLA clusters in the non-metropolitan areas of South Australia

SLA	Socioeconomic status	Health status	Health service utilisation	Social health[1]
Angaston (DC)	Low	Good	Medium	High
Barmera (DC)	Low	Medium	Medium	Medium
Barossa (DC)	High	Good	Low	High
Beachport (DC)	Medium	Good	Low	High
Berri (DC)	Low	Poor	Medium	Medium
Blyth-Snowtown	Medium	Medium	Medium	Medium
Browns Well (DC)	Medium	Medium	Low	High
Burra Burra (DC)	Medium	Poor	Medium	High
Bute (DC)	Medium	Medium	Low	Medium
Carrieton (DC)	High	Poor	High	High
Ceduna (DC)1	Low	Poor	Medium	Low
Central Yorke Peninsula (DC)	Medium	Medium	Medium	Medium
Clare (DC)	High	Medium	Medium	High
Cleve (DC)	High	Medium	Medium	High
Coober Pedy	Medium	Poor	High	Low
Coonalpyn Downs (DC)	High	Good	Low	High
Crystal Brook-Redhill	Medium	Medium	High	High
Dudley (DC)	Medium	Medium	Low	High
Elliston (DC)	Medium	Medium	Medium	High
Eudunda (DC)	Medium	Medium	Medium	Medium
Franklin Harbour (DC)	High	Medium	Low	High
Gumeracha (DC)	High	Good	Low	High
Hallett (DC)	Low	Medium	Medium	Medium
Hawker (DC)	High	Medium	High	High
Jamestown (DC)	Medium	Medium	Medium	High
Kanyaka–Quorn (DC)	Medium	Medium	High	Medium
Kapunda (DC)	High	Medium	Medium	High
Karoonda–East Murray (DC)	Medium	Good	Medium	High
Kimba (DC)	High	Medium	Medium	High
Kingscote (DC)	Medium	Medium	Low	High
Lacepede (DC)	Medium	Good	Medium	High
Lameroo (DC)	High	Medium	High	High
Le Hunte (DC)	High	Good	Low	High
Light (DC)	High	Good	Low	High
Lower Eyre Peninsula (DC)	Medium	Good	Low	High
Loxton (DC)	Low	Medium	Medium	High
Lucindale (DC)	High	Good	Low	High
Mallala (DC)	Medium	Medium	Low	Medium
Mannum (DC)	Low	Medium	Medium	Medium
Meningie (DC)	Low	Medium	High	Medium
Millicent (DC)	Low	Medium	Medium	High
Minlaton (DC)	Medium	Medium	Low	Medium
Morgan (DC)	Medium	Medium	Low	Medium
Mount Barker (DC)	High	Good	Low	High
Mount Gambier (C)	Low	Medium	Medium	High
Mount Gambier (DC)	High	Good	Low	High
Mount Pleasant (DC)	High	Good	Medium	High
Mount Remarkable (DC)	Medium	Medium	Medium	High
Murray Bridge (RC)	Low	Medium	High	Medium
Naracoorte (M)	High	Medium	High	High
Naracoorte (DC)	High	Good	Low	High
Northern Yorke Peninsula (DC)	Medium	Medium	Low	Medium
Onkaparinga (DC)	High	Good	Low	High
Orroroo (DC)	High	Medium	Medium	High
Paringa (DC)	High	Medium	Low	High

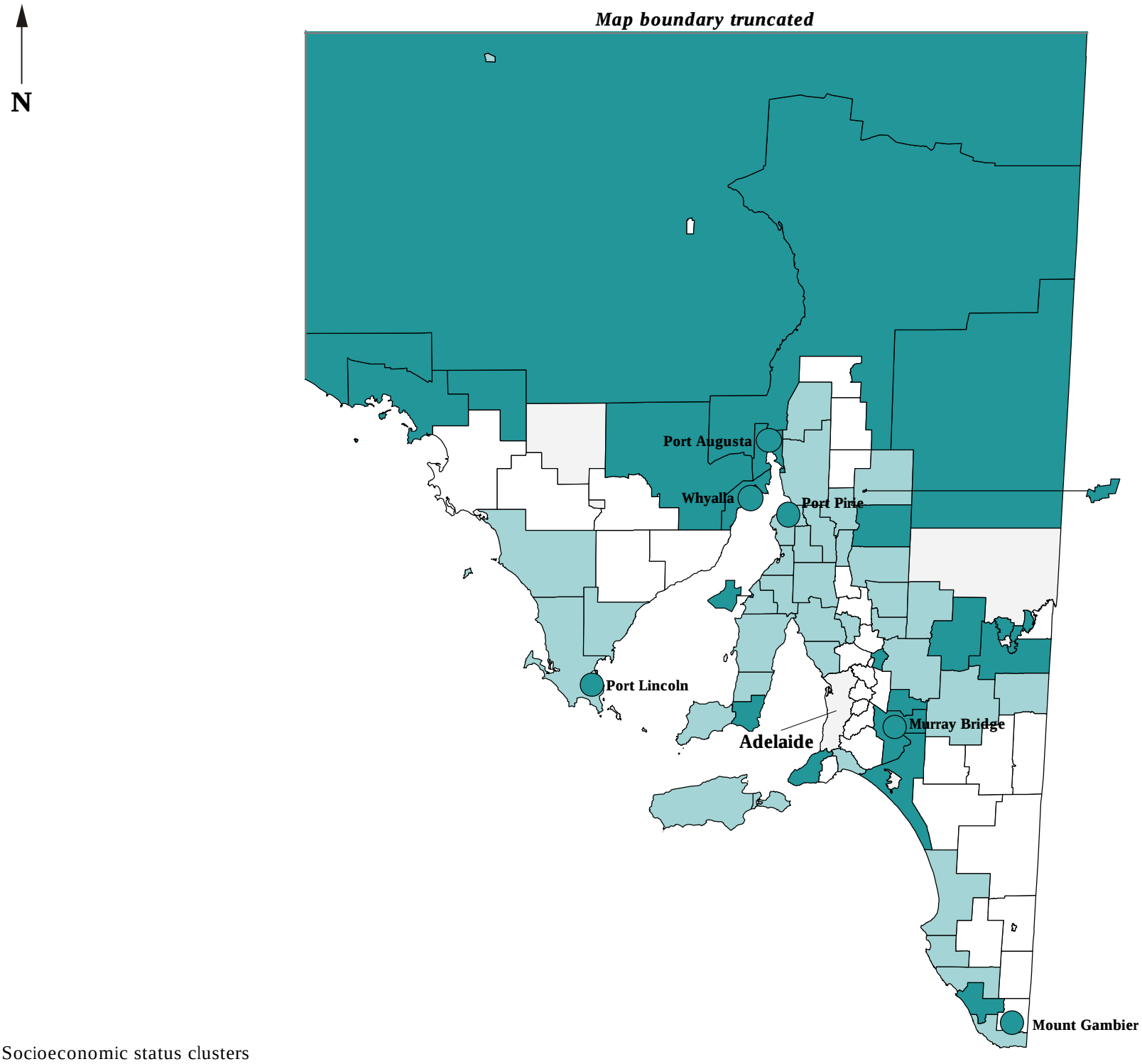
Table 8.5: Composition of SLA clusters in the non-metropolitan areas of South Australia ... *cont*

SLA	Socioeconomic status	Health status	Health service utilisation	Social health[1]
Peake (DC)	High	Medium	Medium	High
Penola (DC)	High	Medium	Medium	High
Peterborough (M)	Low	Poor	Medium	Low
Peterborough DC)	Medium	Medium	Low	Medium
Pinnaroo (DC)	High	Good	Low	High
Pirie (DC)	Medium	Medium	Low	Medium
Port Augusta (C)	Low	Poor	High	Low
Port Broughton (DC)	Medium	Medium	High	Medium
Port Elliot & Goolwa (DC)	Medium	Medium	Medium	Medium
Port Lincoln (C)	Low	Medium	High	Medium
Port MacDonnell (DC)	Medium	Good	Low	High
Port Pirie (C)	Low	Medium	High	Medium
Renmark (M)	Low	Medium	Medium	Medium
Ridley-Truro (DC)	Medium	Medium	Medium	Medium
Riverton (DC)	Medium	Poor	Low	High
Robe (DC)	Medium	Medium	Medium	High
Robertstown (DC)	Medium	Medium	Low	Medium
Rocky River (DC)	Medium	Medium	Medium	High
Roxby Downs (M)	High	Good	Low	High
Saddleworth & Auburn (DC)	High	Good	Medium	High
Spalding (DC)	Medium	Medium	Low	High
Strathalbyn (DC)	High	Medium	Medium	High
Streaky Bay (DC)	High	Medium	Low	High
Tanunda (DC)	High	Medium	Medium	High
Tatiara (DC)	High	Medium	Medium	High
Tumby Bay (DC)	Medium	Medium	Medium	High
Victor Harbor (DC)	High	Medium	Medium	Medium
Waikerie (DC)	Low	Medium	Medium	Medium
Wakefield Plains (DC)	Medium	Medium	Medium	Medium
Wallaroo (DC)	Low	Poor	Medium	Low
Warooka (DC)	Medium	Medium	Low	Medium
Whyalla (C)	Low	Medium	High	Medium
Yankalilla (DC)	Low	Medium	Low	Medium
Yorketown (DC)	Low	Medium	Low	Medium
Unincorporated Riverland	Not grouped	Poor	Low	Low
Unincorporated West Coast	Low	Poor	Not grouped	Low
Unincorporated Whyalla	Low	Medium	Medium	Medium
Unincorporated Pirie	Low	Medium	Medium	Medium
Unincorporated Flinders Rangers	Low	Good	Low	High
Unincorporated Far North	Low	Poor	Low	Low

[1] **Social health 'clusters were produced by a joint analysis of the socioeconomic status and health status variables**

Map 8.5:
Socioeconomic status clusters based on Statistical Local Areas, South Australia

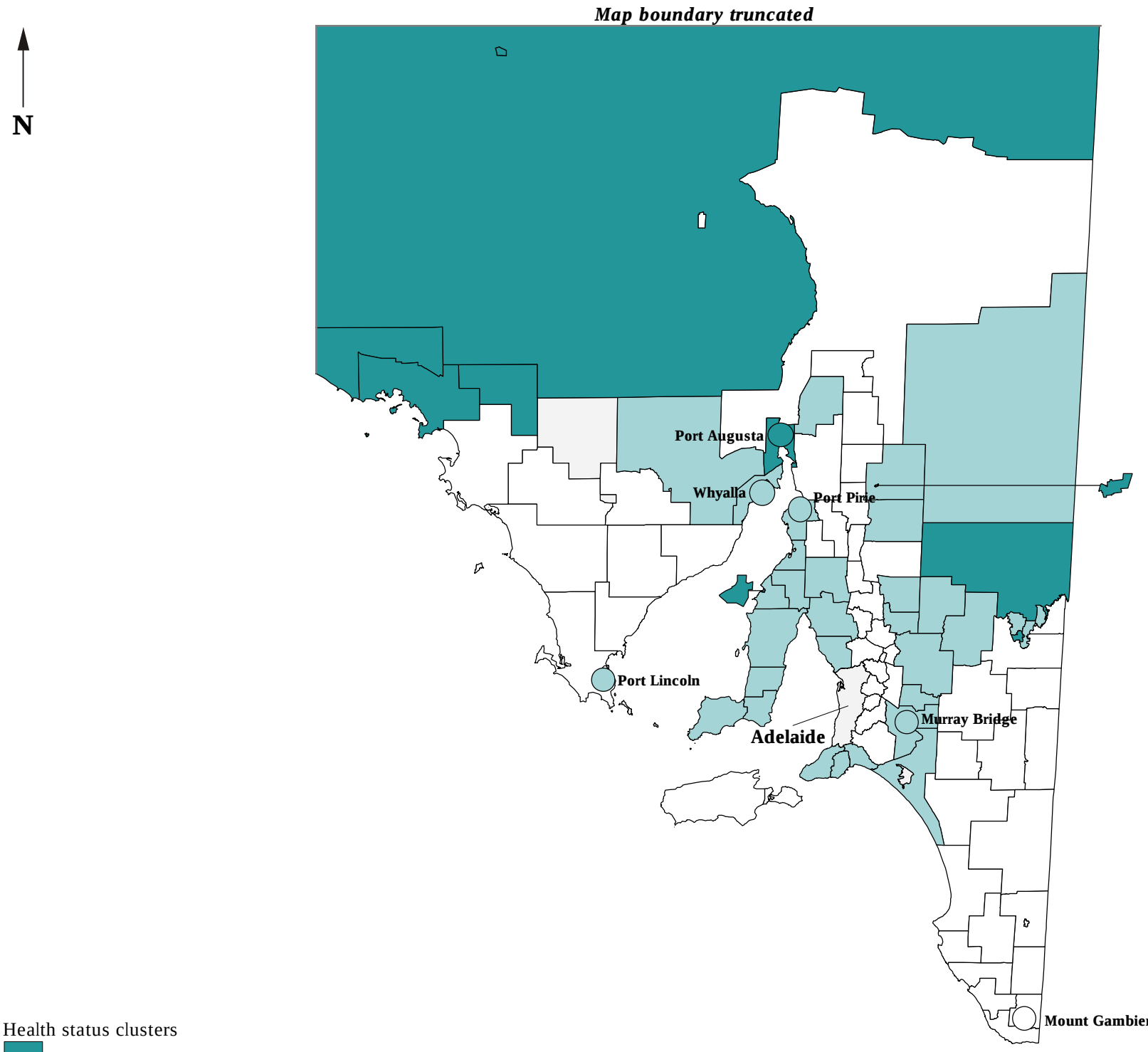
clusters of SLAs with generally similar socioeconomic status characteristics



*Areas not mapped include SLAs with a population of less than 100, Unincorporated Riverland (which was not allocated in the cluster analysis) and Adelaide, which was analysed separately

Source: Compiled from project sources ***Details of map boundaries are in Appendix 1.2***

Map 8.6
Health status clusters based on Statistical Local Areas, South Australia
clusters of SLAs with generally similar health status characteristics



*Areas not mapped include SLAs with a population of less than 100 and Adelaide, which was analysed separately

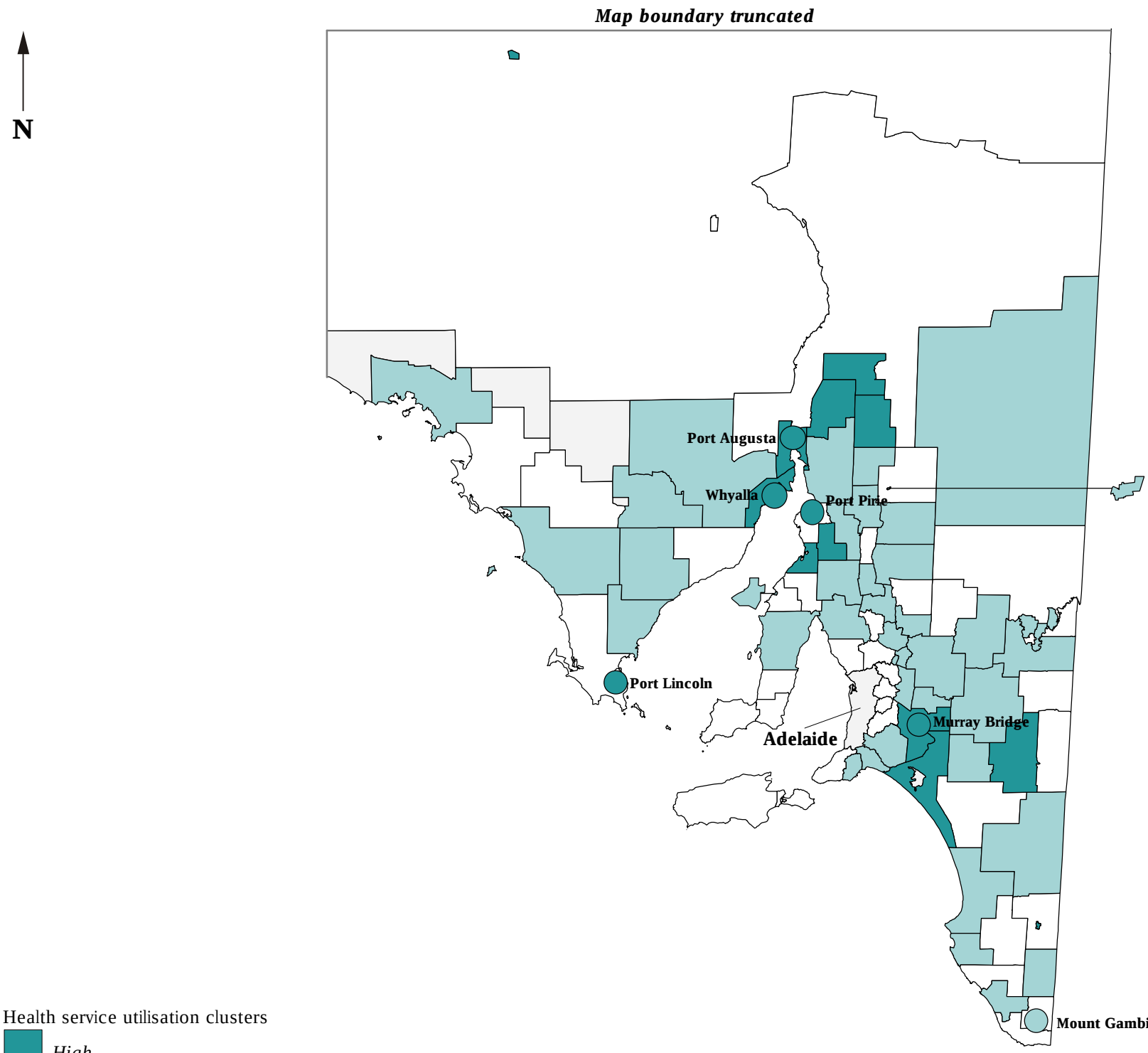
Source: Compiled from project sources

Details of map boundaries are in Appendix 1.2

National Social Health Atlas Project, 1999

Map 8.7
Health service utilisation clusters based on Statistical Local Areas, South Australia

clusters of SLAs with generally similar health service utilisation characteristics



*Areas not mapped include SLAs with a population of less than 100, Unincorporated West Coast (which was not allocated in the cluster analysis) and Adelaide, which was analysed separately

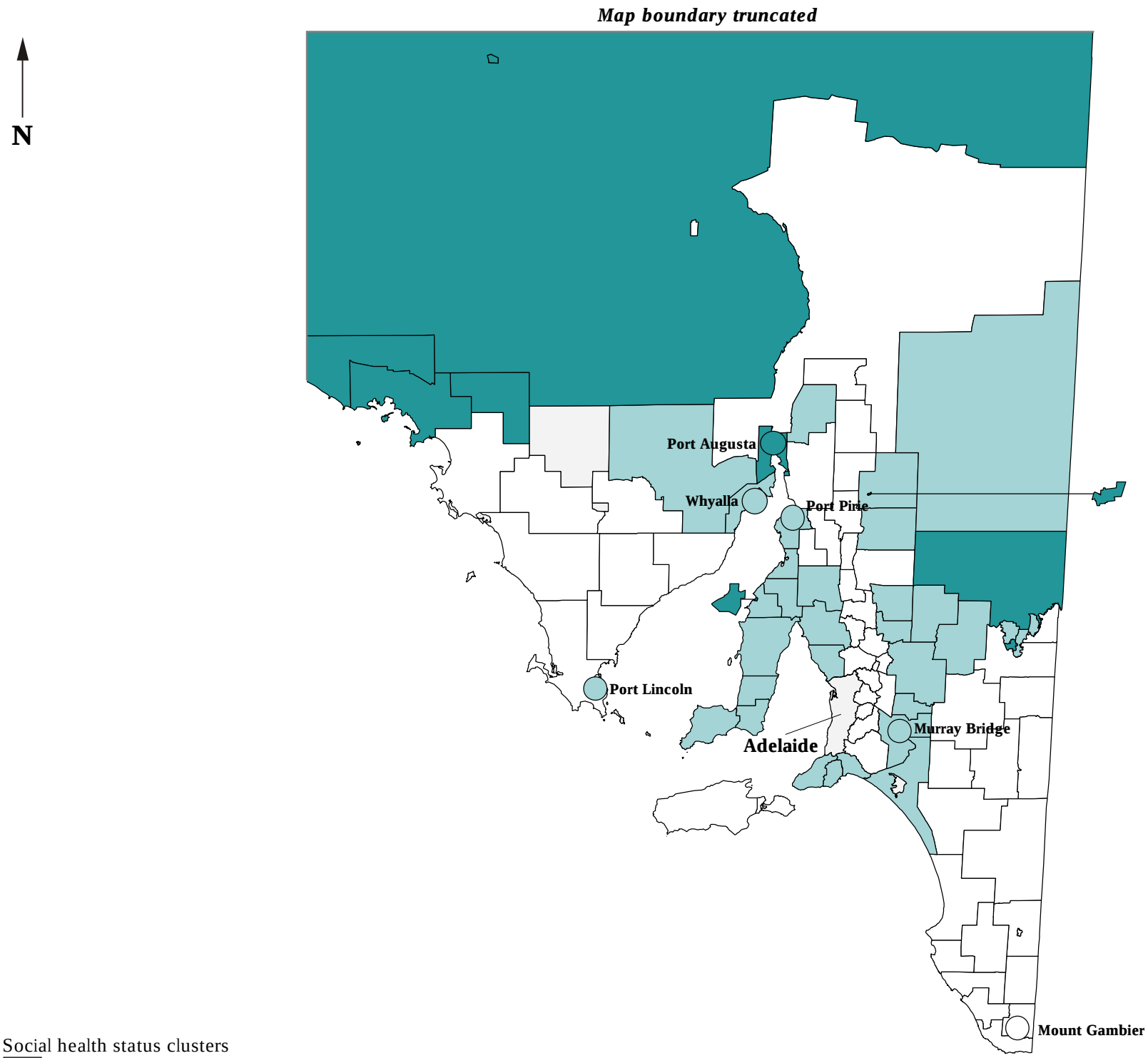
Source: Compiled from project resources

Details of map boundaries are in Appendix 1.2

Map 8.8

Social health status clusters based on Statistical Local Areas, South Australia

clusters of SLAs with generally similar social health status characteristics



Source: Compiled from project resources

Details of map boundaries are in Appendix 1.2

Socioeconomic 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 of the selection of these towns). These 55 records are sufficient to carry out a cluster analysis with the nine input variables.

As the analysis was somewhat complicated, only the main results are discussed below. The full description is in Appendix 1.6.

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.

Although several analyses were tried, the best solution was a four cluster solution (based on low income families, unemployed people, early school leavers, unskilled and semi-skilled workers, Indigenous people and single parent families). This solution is reproduced in **Table 8.6**.

The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was 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 number of alternative strategies were tried in an attempt to produce a satisfactory solution, with the outcome being a three cluster solution of good quality. The clusters were better spread than in other solutions, and it performed better against the IRSD than other solutions (**Table 8.6**).

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 number of alternative strategies were tried in an attempt to produce a satisfactory solution, with the outcome being a three cluster solution of good quality. The clusters were better spread than in other solutions, and it performed better against the IRSD than other solutions (**Table 8.6**).

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 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 reasonable 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, with the outcome 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 (**Table 8.6**).

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.

Table 8.6: Composition of town clusters in Australia

SLA	Socioeconomic status	Health status	Health service utilisation	Social health status[1]
Albany (T)	Very low	Medium	Low	Medium
Albury (C)	High	Medium	Low	Low
Alice Springs (T)	Low	Medium	Medium	Low
Armidale (C)	High	Good	High	High
Ballarat (C)	High	Good	Low	Medium
Bathurst (C)	High	Good	Low	High
Benalla	High	Medium	High	Medium
Bendigo (C)	High	Good	Low	Medium
Broken Hill (C)	Very low	Poor	Low	Medium
Broome (S)	Low	Medium	Medium	Medium
Bunbury (C)	Medium	Good	Medium	High
Burnie (C)	Very low	Poor	Low	Low
Cairns (C)	High	Good	Low	High
Casino (A)	Very low	Medium	Medium	Low
Charters Towers (C)	Medium	Poor	Medium	Not grouped
Colac	Medium	Poor	Low	Low
Dalby (T)	Medium	Medium	Low	High
Deniliquin (A)	High	Poor	Medium	Medium
Devonport (C)	Very low	Medium	Low	Low
Dubbo (C)	High	Good	Medium	Medium
Echuca	High	Medium	Low	Medium
Geraldton (C)	Very low	Medium	Low	Medium
Gladstone (C)	Medium	Good	Low	High
Goulburn (C)	Medium	Medium	Medium	Low
Grafton (C)	Very low	Medium	Medium	Medium
Hamilton	High	Good	Low	Medium
Hervey Bay (C)	Very low	Medium	Low	Low
Horsham (RC)	High	Good	Low	Medium
Inverell (A)	Very low	Medium	High	Medium
Kalgoorlie/Boulder (C)	Medium	Poor	Medium	High
Katherine (T)	Low	Poor	Medium	Low
Launceston (C)	High	Good	Low	Medium
Mandurah (C)	Very low	Medium	Low	Low
Maryborough (C)	Very low	Medium	Low	Medium
Mount Gambier (C)	Medium	Good	High	High
Mount Isa (C)	Medium	Medium	Medium	High
Murray Bridge (RC)	Very low	Medium	Low	Low
Noosa	High	Good	Low	Medium
Orange (C)	High	Good	Medium	Low
Port Augusta (C)	Very low	Poor	Medium	Low
Port Hedland (T)	Medium	Medium	Medium	High
Port Lincoln (C)	Very low	Poor	High	Low
Port Pirie (C)	Very low	Poor	High	Medium
Portland	Very low	Poor	High	Medium
Queanbeyan (C)	High	Good	High	High
Rockhampton (C)	Medium	Good	Low	High
Sale	High	Good	Low	Medium
Shepparton (C)	Medium	Good	Medium	Low
Swan Hill (RC)	High	Good	Low	Medium
Tamworth (C)	High	Medium	Medium	Medium
Toowoomba (C)	Medium	Good	Low	High
Wagga Wagga (C)	High	Good	Medium	High
Wangaratta (RC)	Medium	Good	Medium	Low
Warwick (S)	Medium	Poor	High	Medium
Whyalla (C)	Very low	Medium	High	Low

[1] **Social health 'status clusters were produced by a joint analysis of the socioeconomic status**

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