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## Appendix B: Notes on the data

### General notes

#### Prevalence of smoking among males, 2007-08 (synthetic predictions)/ Prevalence of smoking among females, 2007-08 (synthetic predictions)

The data presented are the estimated number of males and females, respectively, aged 18 years and over who were current smokers, expressed as an age-standardised rate per 100 males and females, respectively.

The data are self-reported data, reported to interviewers in the 2007-08 NHS. A current smoker is defined as an adult who reported, at the time of interview, that they smoked cigarettes, cigars or pipes at least once a week.

For further information on these synthetic estimates, refer to Appendix B.

*Source: Compiled in PHIDU using data estimated from the 2007-08 National Health Survey (NHS), ABS (unpublished - produced as a consultancy); and ABS Estimated Resident Population, average of 30 June 2007 and 2008.*

#### Prevalence of high risk alcohol consumption, 2007-08 (synthetic predictions)

The data presented are the estimated number of people, aged 18 years and over whose alcohol consumption was assessed as putting their health at risk, expressed as an age-standardised rate per 100 persons.

The data are self-reported data, reported to interviewers in the 2007-08 NHS. Using the estimated average daily alcohol consumption over the previous week, respondents were grouped into three categories of relative risk level: low, risky or high risk, based on the 2001 NHMRC guidelines for minimising risk in the longer term. Individuals whose consumption placed them in the risky and high risk categories had exceeded the recommended guidelines.

For further information on these synthetic estimates, refer to Appendix B.

*Source: Compiled in PHIDU using data estimated from the 2007-08 National Health Survey (NHS), ABS (unpublished - produced as a consultancy); and ABS Estimated Resident Population, average of 30 June 2007 and 2008.*

#### Prevalence of overweight and obesity among males, 2007-08 (page 143)/ Prevalence of overweight and obesity among females, 2007-08 (page 147) (synthetic predictions)

The data presented are the estimated number of males and females, respectively, aged 18 years and over who were obese, based on BMI from self-reported height and weight, expressed as an age-standardised rate per 100 males and females, respectively.

The data are self-reported data, reported to interviewers in the 2007-08 NHS. The BMI was calculated from self-reported height and weight data, and grouped as follows, to allow reporting against both WHO and NHMRC guidelines:- healthy range: 18.5 to less than 20.0 and 20.0 to less than 25.0; overweight: 25.0 to less than 30.0; obese: 30.0 and greater.

For further information on these synthetic estimates, refer to Appendix B.

*Source: Compiled in PHIDU using data estimated from the 2007-08 National Health Survey (NHS), ABS (unpublished - produced as a consultancy); and ABS Estimated Resident Population, average of 30 June 2007 and 2008.*

#### Prevalence of physical inactivity, 2007-08 (synthetic predictions)

The data presented are the estimated number of people, aged 15 years and over who were physically inactive, expressed as an age-standardised rate per 100 persons.

The data are self-reported data, reported to interviewers in the 2007-08 NHS. The National Physical Activity Guidelines for Adults recommend at least a moderate level of physical activity, most days of the week, for a total of 30 minutes or more on each of those days, and with each session lasting 10 minutes or

more. Based on these guidelines, people who are sedentary or exercise at low levels will not be achieving the amount of physical activity required to obtain the associated health benefits.

For further information on these synthetic estimates, refer to Appendix B.

*Source: Compiled in PHIDU using data estimated from the 2007-08 National Health Survey (NHS), ABS (unpublished - produced as a consultancy); and ABS Estimated Resident Population, average of 30 June 2007 and 2008.*

### Prevalence of fruit consumption, 2007-08 (synthetic predictions)

The data presented are the estimated number of people, aged 18 years and over who met the NHMRC recommendation for consumption of fruit, expressed as an age-standardised rate per 100 persons.

The data are self-reported data, reported to interviewers in the 2007-08 NHS. The NHMRC Dietary Guidelines recommend that adults consume two serves of fruit per day (a serve is approximately 150 grams of fresh fruit or 50 grams of dried fruit).

For further information on these synthetic estimates, refer to Appendix B.

*Source: Compiled in PHIDU using data estimated from the 2007-08 National Health Survey (NHS), ABS (unpublished - produced as a consultancy); and ABS Estimated Resident Population, average of 30 June 2007 and 2008.*

### Sun protection, 2009-11

The data presented are the number of people aged 18 years and over who reported getting sunburnt in the previous summer; and the number reporting using the five sun protection behaviours (namely, wearing a hat, wearing SPF 30+ sunscreen, wearing clothes that covered all of their arms and legs, wearing sunglasses and seeking shade), as a proportion of all respondents.

The data are self-reported data, reported to interviewers in the Health Omnibus Survey, a household survey undertaken across South Australia and including urban centres with populations of 1,000 or more: as such, the most remote areas of the State are not included, a potential limitation which users should bear in mind when using the data, in particular those presented by remoteness. The survey has a response rate of around 60%: again, this may impact on the data, in particular that presented by socioeconomic status, as response rates are likely to be lowest in disadvantaged areas.

*Source: Compiled in PHIDU using data supplied by Cancer Council SA.*

### Breast screening participation, 2001-02 and 2009-10

The data presented are the number of individual women aged 50 to 69 years screened over a 24-month period ending on 31 December 2007 (Victoria and SA) or 31 December 2008 (Qld, WA and ACT), as a proportion of the female population at those ages.

The participation rate for the 24-month period to the end of each calendar year is based on the actual number of women screened, as a percentage of the average of the ABS Estimated Resident Population (ERP) for the two corresponding calendar years. If a woman attended more than once in the 24 months, she is counted once only, and her age is that at her first visit.

Data are currently available for Victoria, Queensland, South Australia, Western Australia and the Australian Capital Territory. The data do not include women who undergo private screening; the extent to which women use such alternatives is not known.

*Source: Compiled in PHIDU using data supplied by BreastScreen SA.*

### Screen-detected breast cancer, 2001-02 and 2009-10

The data presented are the number of individual women aged 50-69 years diagnosed with screen-detected breast cancers over a 24-month period, ending on 31 December 2010, as an age-standardised rate per 10,000 women screened.

The breast screening outcomes for the 24-month period to the end of each calendar year is based on the actual number of women with cancer outcomes, as an age-standardised rate of the actual number of women screened for the two corresponding calendar years. If a woman has attended more than once in the 24 months, she is counted once only, and her age is that at her first visit.

Breast cancers include both invasive cancers and ductal carcinoma-*in-situ* (DCIS).

*Source: Compiled in PHIDU using data supplied by BreastScreen SA.*

### Cervical screening participation, 2001-02 and 2008-09

The data presented are the number of individual women aged 20 to 69 years screened over a 24-month period ending on 31 December 2009, as a proportion of the eligible female population at those ages who have not undergone a hysterectomy.

The participation rate for the 24-month period to the end of each calendar year, is based on the actual number of women screened as a percentage of the average of the ABS Estimated Resident Population (ERP) for the two corresponding calendar years, adjusted for the proportion of females who have undergone a hysterectomy according to the ABS 2001 National Health Survey. If a woman attended more than once in the 24 months, she is counted once only, and her age is that at her first visit.

*Source: Compiled in PHIDU using data supplied by SA Cervix Screening Program.*

### Abnormalities detected in cervical cancer screening, 2001-02 and 2008-09

The data presented are the number of low grade abnormalities detected through cytology among women aged 20 to 69 year, over a 24 month period ending on 31 December 2009, as an age-standardised rate per 1,000 women screened. If a woman has more than one test in the 24 months in which a low grade is detected, she is counted once only, and the age is taken from the first visit.

The data presented are the number of high grade abnormalities detected through cytology among women aged 20 to 69 year, over a 24 month period ending on 31 December 2009, as an age-standardised rate per 1,000 women screened. If a woman has more than one test in the 24 months in which a high grade is detected, she is counted once only, and the age is taken from the first visit.

*Source: Compiled in PHIDU using data supplied by SA Cervix Screening Program.*

### Cancer incidence, 1986-93, 1998-2002 and 2003-08

The data presented are the number of new cases of cancer registered in each period, expressed as an age-standardised rate per 100,000 population.

Indicators are all cancers (males, females), breast cancer (females aged 30 years and over, both invasive and *in situ*), colorectal (people aged 20 years and over), lung cancer (males, females aged 20 years and over), melanoma (males, females), prostate (both invasive and *in situ*). The data presented have been analysed by age, sex, and region.

*Source: Compiled in PHIDU using data supplied by SA Cancer Registry.*

### Premature mortality, 1992-95, 1997-2001 and 2003-07

The data presented are the number of deaths at ages 0 to 74 years, expressed as an age-standardised rate per 100,000 population.

Indicators are all cancers, breast cancer (females), colorectal cancer and lung cancer (males, females)

*Source: Compiled in PHIDU using data supplied by ABS on behalf of the South Australian Registrar of Deaths; and ABS Estimated Resident Population.*

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# Appendix C: Synthetic predictions of chronic diseases and associated risk factors

## Overview

The synthetic predictions presented in this report for the Priority Areas include:

- Prevalence of smoking among males, females
- High risk alcohol consumption
- Prevalence of overweight and of obesity among males, females
- Physical inactivity
- Usual daily intake of fruit

Further information on the indicators is contained in Appendix A.

## Synthetic predictions modelling

The synthetic predictions of the prevalence of psychological distress, chronic disease and associated risk factors have been produced for a majority of SLAs in South Australia, using modelled survey data collected in the 2007-08 ABS NHS and known characteristics of the area.

A synthetic prediction can be interpreted as the likely value for a 'typical' area with those characteristics: the SLA is the area level of interest for this project (where SLAs had small populations they were grouped to larger areas). This work was undertaken by the Australian Bureau of Statistics (ABS), as they hold the NHS unit record files on which the model is based: the predictor data at the SLA level were compiled by PHIDU.

The approach used is to undertake an analysis of the survey data for Australia to identify associations in the NHS data between the variables that we wish to predict at the small area level (e.g., prevalence of chronic conditions and risk factors) and the data we have at the small area level (e.g., socioeconomic status, use of health services). The relationship between these variables for which we have area level data (the predictors) and the reporting of chronic conditions in the NHS is also a part of the model that is developed by the ABS. For example, such associations might be between the number of people reporting specified chronic conditions in the NHS and:

- the number of visits to a general medical practitioner,
- the proportion of the population receiving a pension or benefit and
- socioeconomic status (as indicated by a range of variables from Census data, including the IRSD).

The results of the modelling exercise are then applied to the SLA counts of the predictors. The prediction is, effectively, the likely value for a typical area with those characteristics. This modelling technique can be considered as a sophisticated prorating of Australian estimates to the small area level. The raw numbers were then age-standardised, to control for the effects of differences in the age profiles of areas.

*The numbers are estimates for an area, not measured events: they should be used as indicators of likely levels of a condition or risk factor in an area.*

Further, the National Health Survey sample includes the majority of people living in private households, but excludes the most remote areas of Australia. Thus it has not been possible to produce estimates for Statistical Local Areas (SLAs) with relatively high proportions of their population in these remote areas. Data for areas with a population of less than 1,000 are also not shown, as well as areas with greater than 75% Aboriginal population, as the authors believe results in these instances are likely to be less reliable.

## Remoteness and quintile estimates

For the remoteness graphs for these eight variables, the data for the Outer Regional, Remote and Very Remote classes were combined, due to the limited number of remote areas included in the National Health Survey. The data for the remoteness classes and the quintiles of socioeconomic disadvantage of area were produced by the ABS, directly from the main unit record file; that is, they are not based on the synthetic predictions.

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## Appendix C: SA Cancer Registry paper (summary presented in Section 3)

### Cancer incidence, stage and survival by region of South Australia

#### An analysis of supplementary data for selected cancers

##### Abstract

Cancer Council South Australia (CCSA) requested data from the South Australian Cancer Registry on incidence, stage of progression at diagnosis and survival by residential area of South Australia to complement data provided by the Public Health Information Development Unit (PHIDU) of the University of Adelaide. Registry data were analysed for the 1995-2008 diagnostic period for Adelaide, Inner Regions and More Remote areas, using the Australian Standard Geographical Classification. The following results presented:

- The age-standardized incidence rate (ASR) for lip cancer was 34% higher in Inner Regions and 101% higher in More Remote areas than in Adelaide. This pattern has been reported in Registry publications since the 1980s. Non-melanoma skin cancers (NMSC, i.e., basal and squamous cell carcinomas) are not recorded by the Registry but elevations in their ASR has often accompanied an elevation in ASR for lip cancer, presumably because excess sun exposure contributes to both. The elevated lip cancer ASR in Very Remote areas of South Australia is probably indicative therefore of an elevated NMSC ASR as well. These cancers are rarely a cause of death but they are the leading cause of hospitalization for cancer and impose a large burden on the health system. This underlines the need for an emphasis on More Remote areas in sun protection programs.
- The invasive female breast cancer ASR was approximately 8% lower in More Remote areas than in Adelaide, which is similar to findings in previous Registry reports and nationally. This has generally been attributed to differences in reproductive history (earlier childbirth and higher parity in more remote areas), although use of hormone replacement therapy and/or other risk factors may have contributed.
- A higher proportion of invasive female breast cancers were large ( $\geq 30$ mm) at diagnosis in patients from More Remote areas than Adelaide (23% c/f 20%). This did not apply to the BreastScreen SA target age range of 50-69 years however, which may be a BreastScreen SA effect in reducing socio-demographic inequalities. There is a need to give emphasis to Very Remote areas when promoting earlier detection, especially for those age groups outside the screening target age range. This would apply to Aboriginal and Torres Strait Islander women in particular, since they have more advanced breast cancers at diagnosis and lower survivals from this cancer than other women.
- A higher proportion of invasive melanomas were found to be thicker than 1.5mm in patients from Inner Regions and More Remote areas (23%) than Adelaide (20%), indicating the need to give special attention to these localities when promoting early detection.
- Case survivals for all cancers combined were a little lower in More Remote areas than in Adelaide both at five years from diagnosis (62% c/f 64%) and at 10 years (58% c/f 60%), which were influenced by poorer survivals from cancers of the female breast, cervix, colon/rectum, prostate, skin (melanoma) and lung. Similar findings have been reported nationally. However the differences were very small overall and generally would have been of little or no public health significance. However, this may not have applied to all population sub-groups. For example, Aboriginal and Torres Strait Islander patients have much poorer survivals than other patients and likely would have contributed disproportionately to the poorer survivals in More Remote areas. The barriers preventing better outcomes in these patients warrant special investigation and attention.

## Introduction

Cancer Council South Australia (CCSA) has sought data from the SA Cancer Registry on incidence, stage of progression of cancer at diagnosis and survival by residential region for specified cancers in South Australia. This followed reports of less favourable cancer outcomes in rural and remote than urban areas in some interstate locations.<sup>1,2</sup> The data in this report are a response to that request. They are not intended to be complete in stand-alone terms but complementary to data compiled separately by PHIDU to meet CCSA needs. The present data should therefore be regarded as selective and complementary.

Annual reports of the SA Cancer Registry have for many years shown differences in incidence and survival for cancers by residential area of South Australia.<sup>3,4</sup> In general the data have shown survivals to be a little lower for non-metropolitan than metropolitan patients although differences generally were very small, often not statistically significant, and when statistically significant, normally too small in magnitude to be of public health significance.<sup>4</sup> Also, only minor differences in incidence have normally applied, although an exceptional finding has been the much higher incidence of cancer of the lip in non-metropolitan areas.<sup>5</sup> This has been demonstrated in annual Registry reports for many years.<sup>3,5</sup> Lip cancers occur on the outer vermilion border of the lower lip and their higher incidence in non-metropolitan areas is attributed to excess sun exposure.<sup>5</sup>

International data often show a similar pattern of incidence of lip cancer and non-melanoma skin cancers (basal and squamous cell carcinomas) probably because both are sun related.<sup>5</sup> The elevated incidence of lip cancer in non-metropolitan residents is likely therefore to be a marker of an elevated risk of non-melanoma skin cancers as well. While rarely a cause of death, non-melanoma skin cancers are a major cost to the health system, accounting for more hospital admissions than any other cancer type.<sup>6</sup>

In this report incidence data are provided for cancers of the lip, female breast, cervix and skin (melanoma) by residential area of South Australia. These cancers were chosen to complement data from PHIDU. They were selected either because of their relevance to sun exposure (lip and skin) or screening (female breast and cervix). Data on staging characteristics available from the SA Cancer Registry for cancers of the breast and melanoma are provided, but staging data were not collected for cancers of the lip and cervix.

In addition five- and 10- year survivals are presented for all cancers collectively and for cancers of the prostate, female breast, colon/rectum (large bowel), skin (melanoma), cervix and lung. These cancers were selected either because they had relevance to early detection initiatives or in the case of all cancers collectively and cancers of the colon/rectum, lung, and potentially prostate, breast and cervix, because they have been found to have comparatively low survivals in remote geographic areas of Australia in national studies.<sup>7</sup>

## Methods

SA Cancer Registry data were analysed for the 1995-2008 diagnostic period. This period was chosen to gain enough cancer data for incidence analyses and sufficient follow-up time for survival estimation. For comparison by geographical region, the population of South Australia was classified using the Australian Standard Geographical Classification as Adelaide, Inner Regions, and More Remote.<sup>7</sup>

Incidence data were age standardized directly using the 2001 Australian age distribution as the reference standard.<sup>8</sup> Mean annual rates were provided by place of residence together with 95% confidence limits calculated using the traditional method described by Cochran.<sup>9</sup>

Staging data included in-situ and invasive stage for female breast cancer and melanoma, plus invasive breast cancer diameter and invasive melanoma thickness. Differences by region of residence were analysed using relevant rank-order tests (i.e., Mann Whitney U Test and Kendall tau b correlation coefficients, as appropriate).<sup>8</sup>

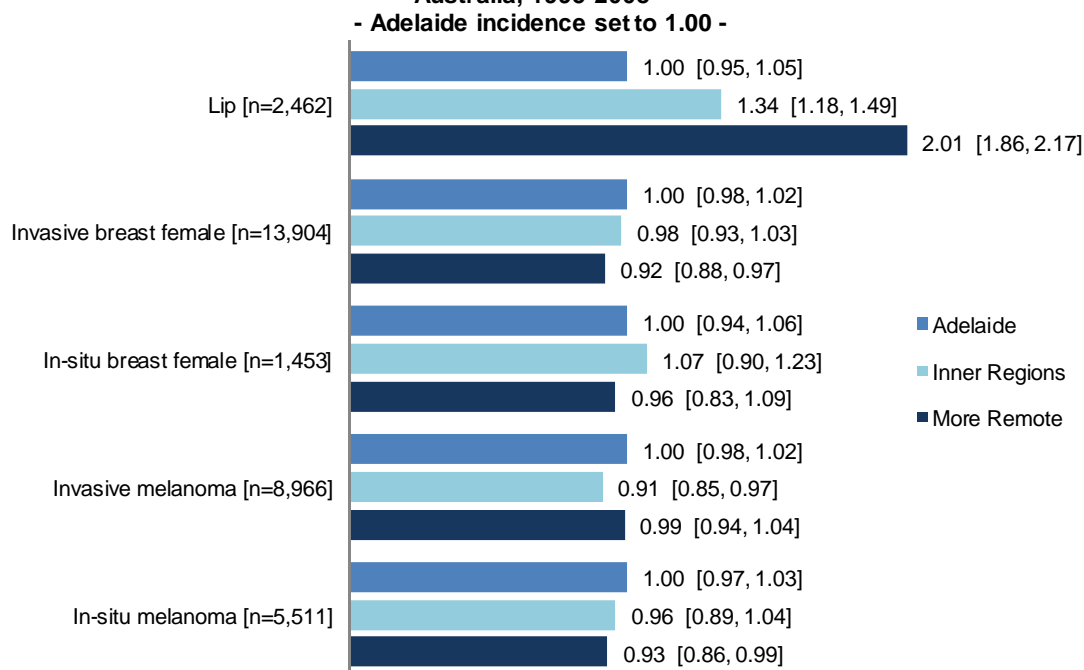
Disease-specific survivals were calculated for invasive cancers.<sup>8</sup> Disease-specific survival has been shown to be a good proxy in South Australia for relative survival and was used because life tables were not readily available for the regional groupings employed.<sup>10</sup> The date of censoring of live cases in the survival analyses was December 31<sup>st</sup>, 2008. Standard uni-variable survival analyses were undertaken, plus multi-variable Cox proportional hazards regression to adjust for potential confounding from differences in age at diagnosis and gender in comparisons across regions.<sup>8</sup>

## Results

### Incidence

As observed in previous annual reports of the SA Cancer Registry,<sup>3,5,10</sup> the mean annual incidence rate for lip cancer was higher in Inner Regions and More Remote areas than in Adelaide, with elevations of 34% and 101% respectively (Figure 1). The approximate 2-fold elevation for More Remote areas is consistent with elevations observed in previous Registry reports.<sup>3,5,10</sup>

**Figure 1: Mean annual age-standardized incidence (95% CLs); South Australia, 1995-2008\***



\* Age-standardized to Australian population 2001. Regions classified using ASGC 2007.

By comparison, the incidence of invasive breast cancer was about 8% lower in More Remote areas than in Adelaide (Figure 1). The incidence of invasive breast cancer in Inner Regions tended to be a little lower than for Adelaide (2 % lower) but confidence intervals overlapped and the difference was not statistically significant ( $p>0.05$ ). The lower incidence observed in More Remote areas is considered to be real and is consistent with national reporting.<sup>11</sup>

Apart from a lower invasive melanoma incidence in Inner Regions than in Adelaide (9% lower), there were no other statistically significant differences in incidence by region.

### **Data related to diagnostic stage**

#### *Breast cancer diameters*

The percentage of invasive breast cancers classified as large (i.e., 30+ mm diameter) was higher in More Remote than other areas of South Australia (i.e., 23.3% compared with 19.6%) (Figure 2). A more detailed analysis of diameter distribution (<15, 15-19, 20-29 and 30+mm) by region, with adjustment for age at diagnosis (<40, 40-49, 50-69, 70+ years), confirmed that there was an elevation in proportion of invasive cancers with larger diameters in areas that were more remote from Adelaide ( $p<0.001$ ).

While this trend applied to 40-49 year olds ( $p=0.002$ ) and 70+ year olds ( $p<0.001$ ), it was not evident for the 50-69 year old screening target ( $p=0.994$ ). Among 50-69 year olds, all of whom are eligible for screening, the percentages of breast cancers classified as large were 17.1% for Adelaide residents, 16.1% for Inner Regions, and 16.7% for More Remote areas. These data are not suggestive of more advanced stages in non-metropolitan areas.

**Figure 2: Percentage of invasive female breast cancers of large size (diameters 30+mm) (95%CLs); South Australia, 1995-2008\***



\*Regions classified using ASGC 2007. Numbers of cases: see Figure 1.

There was not a statistically significant variation however in the proportion of breast cancers detected at an in-situ as opposed to invasive stage by region, the proportions being 9.3% for Adelaide, 10.2% for Inner Regions and 9.9% for More Remote areas (Figure 3). This was confirmed in more detailed analyses of in-situ percentages by region when adjusting for age at diagnosis (<40, 40-49, 50-69, 70+ years) ( $p=0.366$ ). Moreover, there was no difference by region within specific age categories ( $p\geq 0.250$ ), including in the 50-69 year screening target ( $p=0.508$ ).

**Figure 3: Percentage of breast cancers detected at in-situ stage (95% CLs); South Australia, 1995-2008\***



\*Regions classified using ASGC 2007. Numbers of cases: see Figure 1. In-situ % estimated from 15,357 cases.

### Melanoma thickness

The percentage of invasive melanomas that were thick at diagnosis (i.e., thickness >1.5mm) was higher in non-metropolitan areas (22.9% in More Remote and 22.7% in Inner Regions compared with 20.2% in Adelaide). Confidence intervals overlapped and differences were not statistically significant ( $p > 0.05$ ) (Figure 4). However when a more detailed analysis was undertaken of thickness ( $\leq 0.75$ , 0.76-1.50, 1.51-3.00, >3.00mm) by region, adjusting for age at diagnosis (<40, 40-49, 50-59, 60-69, 70+ years), thickness was found to be greater in areas that were more remote from Adelaide ( $p = 0.001$ ) and a similar trend presented in all age groups that achieved statistical significance in 50-59 year olds ( $p = 0.038$ ) and 60-69 year olds ( $p < 0.001$ ).

**Figure 4: Percentage of invasive melanomas of thickness greater than 1.5mm (95%CLs); South Australia, 1995-2008\***



\*Regions classified using ASGC 2007. Numbers of cases: see Figure 1.

There was no statistically significant variation however in the proportion of melanomas detected at an in-situ as opposed to invasive cancer stage by region, with these proportions being 38.1% in Adelaide, 39.8% in Inner Regions, and 36.5% in More Remote areas (Figure 5). This null finding was confirmed in more detailed analysis of in-situ percentage by region, when adjusting for age at diagnosis (<40, 40-49, 50-59, 60-69, 70+ years) ( $p = 0.383$ ). Also no differences were found within individual age categories ( $p \geq 0.189$ ).

**Figure 5: Percentage of melanomas detected at in-situ stage (95% CLs); South Australia, 1995-2008\***

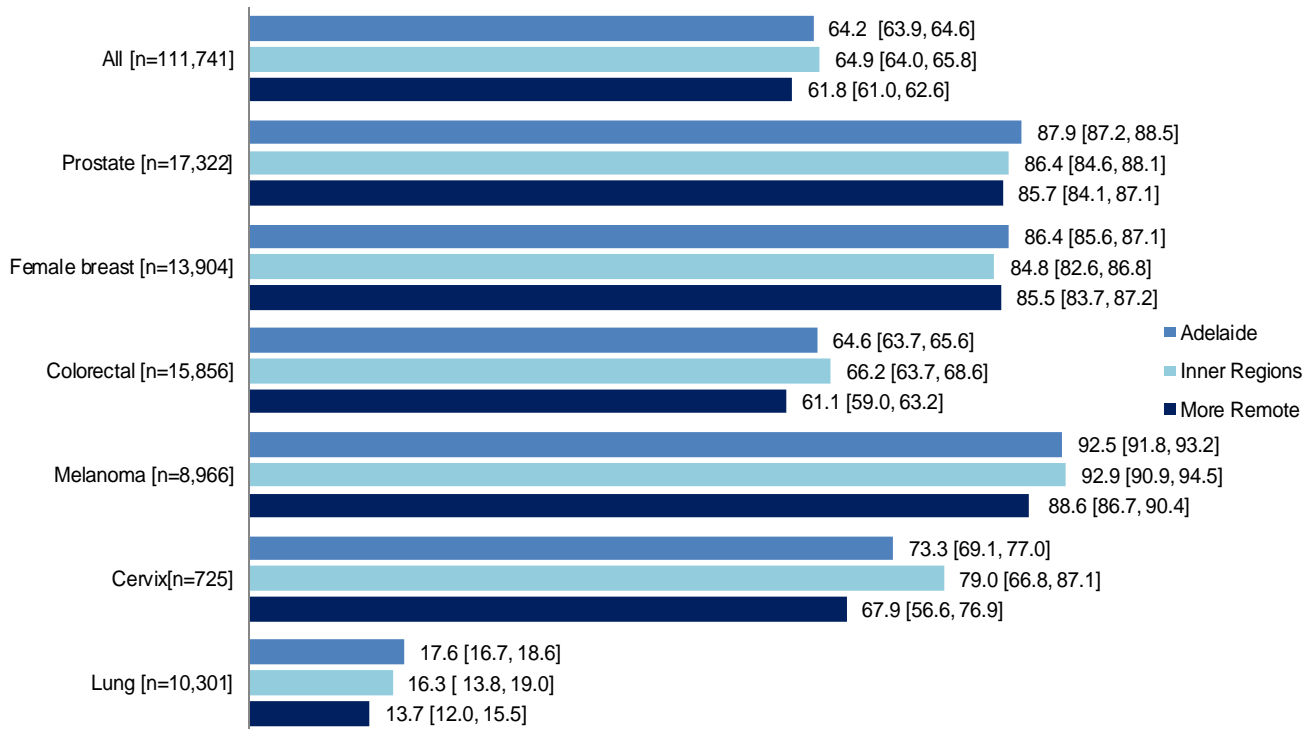


\*Regions classified using ASGC 2007. Numbers of cases: see Figure 1. In-situ % estimated from 14,477 cases.

### Survival

Generally 5-year survivals were a little lower for patients from More Remote areas than Adelaide. This applied for all cancers collectively (61.8% c/f 64.2%) and cancers of the prostate (85.7% c/f 87.9%), colon/rectum (61.1% c/f 64.6%), skin (melanoma) (88.6% c/f 92.5%) and lung (13.7% c/f 17.6%). These differences, while potentially of little importance in public health terms, were probably real, in that 95% confidence intervals did not overlap (Figure 6). A similar difference was suggested for cancer of the cervix, but this was more likely to be a chance event. In no comparison was a non-random difference in survival indicated between patients from Inner Regions and Adelaide.

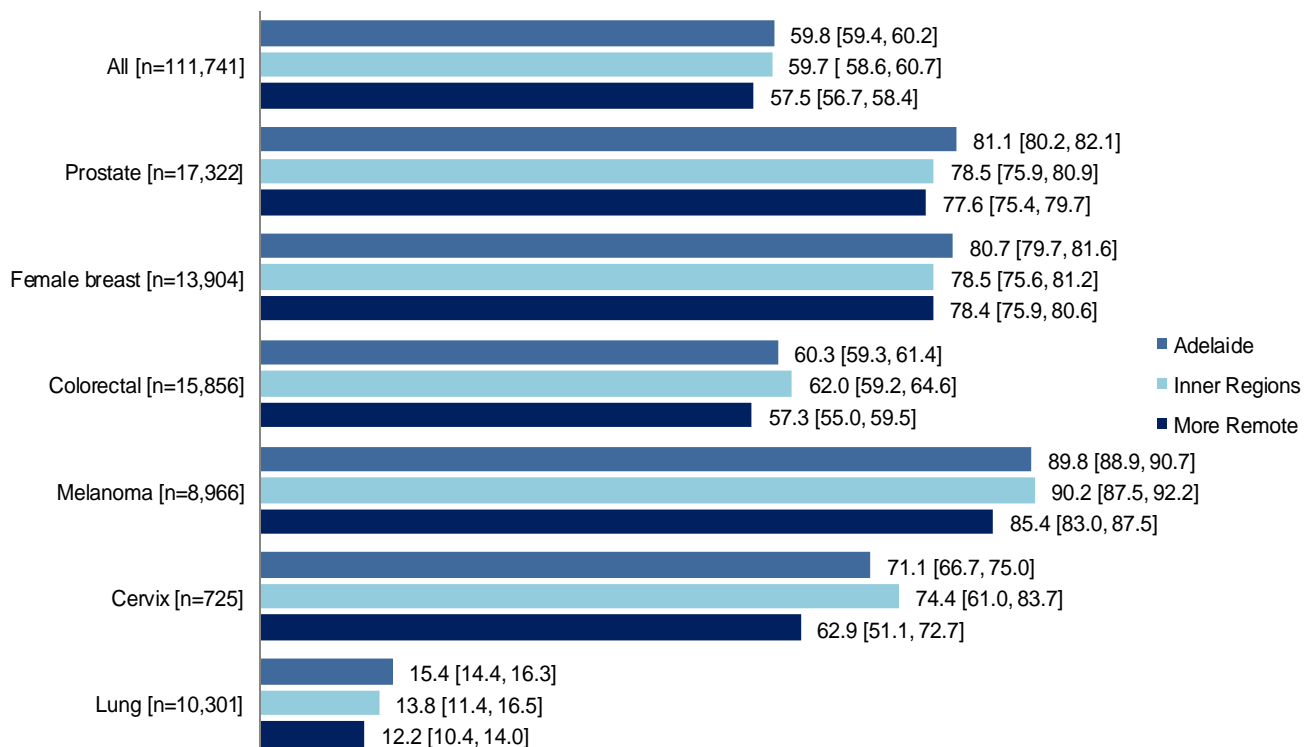
**Figure 6: Percentage 5-year survival (disease specific) (95% CLs); South Australia, 1995-2008\***



\* Date of censoring of live cases, December 31, 2008. Invasive cancers only.

Similarly 10-year survivals were marginally lower for patients from More Remote areas than Adelaide. This applied for all cancers collectively (57.5% c/f 59.8%) and cancers of the prostate (77.6% c/f 81.1%), skin (melanoma) (85.4% c/f 89.8%) and lung (12.2% c/f 15.4%). Again, differences were very small and potentially of little importance in public health terms but probably real, in that 95% confidence intervals did not overlap (Figure 7). Similar differences were suggested for cancers of the female breast, colon/rectum, and cervix, but they were more likely to be chance events. In no comparison was a non-random difference in survival indicated between patients from Inner Regions and Adelaide.

**Figure 7: Percentage 10-year survival (disease specific) (95% CLs); South Australia, 1995-2008\***



\*Date of censoring live cases, December 31, 2008. Invasive cases only.

When multivariable Cox proportional hazards regression analyses were performed, with relative risks of death (i.e., hazards ratios) from the index cancer assessed by region of residence after adjusting for age at diagnosis (classified as <40, 40-49, 50-59, 60-69, 70-79 and 80+ years), and where relevant by gender, the relative risk was higher for patients from More Remote areas than Adelaide for all cancers collectively and each cancer type shown in Figures 6/7 ( $p < 0.05$ ). Generally there was no difference in risk between patients from Inner Regions and Adelaide ( $p > 0.05$ ), apart from prostate cancer patients where an elevated risk was suggested in patients from Inner Regions (relative risk 1.15 (95% CLs: 1.01, 1.30)).

## Discussion

The two-fold incidence of lip cancer in More Remote areas than Adelaide is consistent with observations reported in SA Cancer Registry reports since the 1980s.<sup>3, 5, 10</sup> Lip cancer is sun-related and its incidence is often high in populations with a high incidence of sun-related non-melanoma skin cancers (basal and squamous cell carcinomas).<sup>5</sup> While these cancers rarely are a cause of death,<sup>4</sup> they account for more hospital admissions in Australia than any other cancer type.<sup>6</sup> There is a general need to promote sun protection to lower the incidence of these cancers, especially in More Remote areas with elevated risks.

Conversely the risk of invasive breast cancer is lower in More Remote areas than in Adelaide. This is consistent with national observations of geographic differences and data previously reported for South Australia.<sup>11</sup> Differences in reproductive history are thought to have contributed to this pattern, with earlier first full-term pregnancy and higher parity being protective for this cancer. Another possible contributing factor would be use of hormone replacement therapy, if this were to vary by Region.<sup>11</sup>

Invasive breast cancers were more likely to be large (30+mm diameter) in More Remote areas (23%) than for Adelaide residents (20%). It is notable however that this difference did not apply to the BreastScreen SA target age range of 50-69 years, which probably reflects the effect of BreastScreen SA in reducing socio-demographic inequalities. There is a need to promote earlier detection in More Remote areas for women outside the screening target age range. This would apply in particular to Aboriginal and Torres Strait Islander women who have more advanced stages at diagnosis and poorer survival outcomes.<sup>11, 12</sup>

Invasive melanomas were more likely to be thick (>1.50mm) in residents of Inner Regions and More Remote areas (23%) than for Adelaide residents (20%). This trend applied in each age category and was statistically significant in 50-59 and 60-69 year olds. Again, this highlights a need for a special emphasis in early detection programs on non-metropolitan regions.

Case survivals for all cancers combined were a little lower in More Remote areas than in Adelaide both at five years from diagnosis (62% c/f 64%) and at 10 years (58% c/f 60%). Multivariable analysis confirmed that case fatality rates were higher in Very Remote areas for all invasive cancers collectively, and that cancers of the female breast, cervix, colon/rectum, prostate, skin (melanoma) and lung contributed to these higher case fatalities. It is clear though that the differences were very small and generally would have been of little or no public health significance. That said, there would be some sub-groups who would have contributed disproportionately to poorer outcomes in More Remote areas, including Aboriginal and Torres Strait Islander patients where barriers to better outcomes require special attention.<sup>11</sup>

Less ready access to treatment is likely to apply in many of these More Remote areas, despite the attempts already made to optimize care availability through telemedicine and support for transport services and accommodation for those who require specialist services in Adelaide. Present initiatives to strengthen service availability in major non-metropolitan centres should also facilitate better access to care for many non-metropolitan patients.

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## Key to areas mapped for indicators, Adelaide and South Australia

### Alphabetical Key to Statistical Local Areas in Adelaide

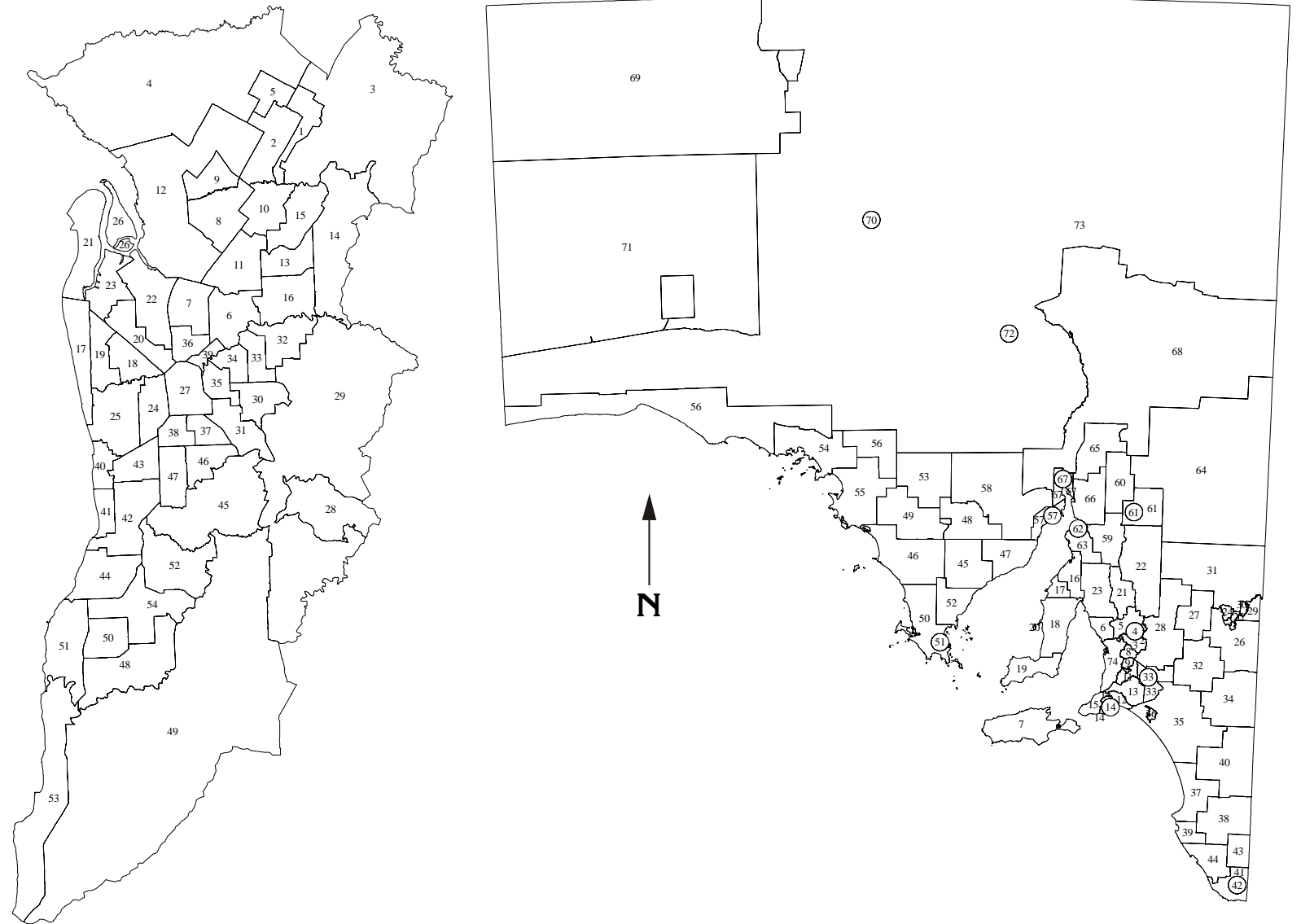
27 Adelaide (C)	47 Mitcham (C) - West	22 Port Adel. Enfield (C) - Park
28 Adelaide Hills (DC) - Central	34 Norw. P'ham St Ptrs (C) - East	23 Port Adel. Enfield (C) - Port
29 Adelaide Hills (DC) - Ranges	35 Norw. P'ham St Ptrs (C) - West	36 Prospect (C)
30 Burnside (C) - North-East	48 Onkaparinga (C) - Hackham	8 Salisbury (C) - Central
31 Burnside (C) - South-West	49 Onkaparinga (C) - Hills	9 Salisbury (C) - Inner North
32 Campbelltown (C) - East	50 Onkaparinga (C) - Morphett	10 Salisbury (C) - North-East
33 Campbelltown (C) - West	51 Onkaparinga (C) - North Coast	11 Salisbury (C) - South-East
17 Charles Sturt (C) - Coastal	52 Onkaparinga (C) - Reservoir	12 Salisbury (C) Bal
18 Charles Sturt (C) - Inner East	53 Onkaparinga (C) - South Coast	13 Tea Tree Gully (C) - Central
19 Charles Sturt (C) - Inner West	54 Onkaparinga (C) - Woodcroft	14 Tea Tree Gully (C) - Hills
20 Charles Sturt (C) - North-East	1 Playford (C) - East Central	15 Tea Tree Gully (C) - North
40 Holdfast Bay (C) - North	2 Playford (C) - Elizabeth	16 Tea Tree Gully (C) - South
41 Holdfast Bay (C) - South	3 Playford (C) - Hills	26 Unincorp. Western
42 Marion (C) - Central	4 Playford (C) - West	37 Unley (C) - East
43 Marion (C) - North	5 Playford (C) - West Central	38 Unley (C) - West
44 Marion (C) - South	21 Port Adel. Enfield (C) - Coast	39 Walkerville (M)
45 Mitcham (C) - Hills	6 Port Adel. Enfield (C) - East	24 West Torrens (C) - East
46 Mitcham (C) - North-East	7 Port Adel. Enfield (C) - Inner	25 West Torrens (C) - West

**Note: See overleaf for Numerical Key**

### Alphabetical Key to Statistical Local Areas in non-metropolitan South Australia

8 Adelaide Hills (DC) - North	5 Light (RegC)	34 Southern Mallee (DC)
9 Adelaide Hills (DC) Bal	50 Lower Eyre Peninsula (DC)	55 Streaky Bay (DC)
12 Alexandrina (DC) - Coastal	26 Loxton Waikerie (DC) - East	40 Tatiara (DC)
13 Alexandrina (DC) - Strathalbyn	27 Loxton Waikerie (DC) - West	35 The Coorong (DC)
69 Anangu Pitjantjatjara (AC)	6 Mallala (DC)	52 Tumby Bay (DC)
2 Barossa (DC) - Angaston	71 Maralinga Tjarutja (AC)	73 Unincorp. Far North
3 Barossa (DC) - Barossa	28 Mid Murray (DC)	68 Unincorp. Flinders Ranges
4 Barossa (DC) - Tanunda	10 Mount Barker (DC) - Central	53 Unincorp. Lincoln
16 Barunga West (DC)	11 Mount Barker (DC) Bal	36 Unincorp. Murray Mallee
24 Berri & Barmera (DC) - Barmera	42 Mount Gambier (C)	64 Unincorp. Pirie
25 Berri & Barmera (DC) - Berri	66 Mount Remarkable (DC)	31 Unincorp. Riverland
54 Ceduna (DC)	33 Murray Bridge (RC)	56 Unincorp. West Coast
21 Clare and Gilbert Valleys (DC)	33 Murray Bridge (RC)	58 Unincorp. Whyalla
45 Cleve (DC)	38 Naracoorte and Lucindale (DC)	20 Unincorp. Yorke
70 Coober Pedy (DC)	59 Northern Areas (DC)	14 Victor Harbor (C)
17 Copper Coast (DC)	60 Orroroo/Carrieton (DC)	14 Victor Harbor (C)
46 Elliston (DC)	61 Peterborough (DC)	23 Wakefield (DC)
65 Flinders Ranges (DC)	61 Peterborough (DC)	43 Wattle Range (DC) - East
47 Franklin Harbour (DC)	67 Port Augusta (C)	44 Wattle Range (DC) - West
1 Gawler (T)	67 Port Augusta (C)	57 Whyalla (C)
22 Goyder (DC)	51 Port Lincoln (C)	57 Whyalla (C)
41 Grant (DC)	63 Port Pirie C Dists (M) Bal	15 Yankalilla (DC)
7 Kangaroo Island (DC)	62 Port Pirie C Dists (M) City	18 Yorke Peninsula (DC) - North
32 Karoonda East Murray (DC)	29 Renmark Paringa (DC) - Paringa	19 Yorke Peninsula (DC) - South
48 Kimba (DC)	30 Renmark Paringa (DC) - Renmark	74 Metro Adelaide
37 Kingston (DC)	39 Robe (DC)	
49 Le Hunte (DC)	72 Roxby Downs (M)	

**Note: See overleaf for Numerical Key**



**SLA status key:** Cities (C), Rural Cities (RC), Municipalities/Municipal Councils (M), District Councils (DC), Regional Councils (RegC) and Aboriginal Councils (AC)

## Key to areas mapped for indicators, Adelaide and South Australia ...cont

### Numerical Key to Statistical Local Areas in Adelaide

1 Playford (C) - East Central	19 Charles Sturt (C) - Inner West	37 Unley (C) - East
2 Playford (C) - Elizabeth	20 Charles Sturt (C) - North-East	38 Unley (C) - West
3 Playford (C) - Hills	21 Port Adel. Enfield (C) - Coast	39 Walkerville (M)
4 Playford (C) - West	22 Port Adel. Enfield (C) - Park	40 Holdfast Bay (C) - North
5 Playford (C) - West Central	23 Port Adel. Enfield (C) - Port	41 Holdfast Bay (C) - South
6 Port Adel. Enfield (C) - East	24 West Torrens (C) - East	42 Marion (C) - Central
7 Port Adel. Enfield (C) - Inner	25 West Torrens (C) - West	43 Marion (C) - North
8 Salisbury (C) - Central	26 Unincorp. Western	44 Marion (C) - South
9 Salisbury (C) - Inner North	27 Adelaide (C)	45 Mitcham (C) - Hills
10 Salisbury (C) - North-East	28 Adelaide Hills (DC) - Central	46 Mitcham (C) - North-East
11 Salisbury (C) - South-East	29 Adelaide Hills (DC) - Ranges	47 Mitcham (C) - West
12 Salisbury (C) Bal	30 Burnside (C) - North-East	48 Onkaparinga (C) - Hackham
13 Tea Tree Gully (C) - Central	31 Burnside (C) - South-West	49 Onkaparinga (C) - Hills
14 Tea Tree Gully (C) - Hills	32 Campbelltown (C) - East	50 Onkaparinga (C) - Morphett
15 Tea Tree Gully (C) - North	33 Campbelltown (C) - West	51 Onkaparinga (C) - North Coast
16 Tea Tree Gully (C) - South	34 Norw. P'ham St Ptrs (C) - East	52 Onkaparinga (C) - Reservoir
17 Charles Sturt (C) - Coastal	35 Norw. P'ham St Ptrs (C) - West	53 Onkaparinga (C) - South Coast
18 Charles Sturt (C) - Inner East	36 Prospect (C)	54 Onkaparinga (C) - Woodcroft

### Numerical Key to Statistical Local Areas in non-metropolitan South Australia

1 Gawler (T)	27 Loxton Waikerie (DC) - West	53 Unincorp. Lincoln
2 Barossa (DC) - Angaston	28 Mid Murray (DC)	54 Ceduna (DC)
3 Barossa (DC) - Barossa	29 Renmark Paringa (DC) - Paringa	55 Streaky Bay (DC)
4 Barossa (DC) - Tanunda	30 Renmark Paringa (DC) - Renmark	56 Unincorp. West Coast
5 Light (RegC)	31 Unincorp. Riverland	57 Whyalla (C)
6 Mallala (DC)	32 Karoonda East Murray (DC)	57 Whyalla (C)
7 Kangaroo Island (DC)	33 Murray Bridge (RC)	58 Unincorp. Whyalla
8 Adelaide Hills (DC) - North	33 Murray Bridge (RC)	59 Northern Areas (DC)
9 Adelaide Hills (DC) Bal	34 Southern Mallee (DC)	60 Orroroo/Carrieton (DC)
10 Mount Barker (DC) - Central	35 The Coorong (DC)	61 Peterborough (DC)
11 Mount Barker (DC) Bal	36 Unincorp. Murray Mallee	61 Peterborough (DC)
12 Alexandrina (DC) - Coastal	37 Kingston (DC)	62 Port Pirie C Dists (M) City
13 Alexandrina (DC) - Strathalbyn	38 Naracoorte and Lucindale (DC)	63 Port Pirie C Dists (M) Bal
14 Victor Harbor (C)	39 Robe (DC)	64 Unincorp. Pirie
14 Victor Harbor (C)	40 Tatiara (DC)	65 Flinders Ranges (DC)
15 Yankalilla (DC)	41 Grant (DC)	66 Mount Remarkable (DC)
16 Barunga West (DC)	42 Mount Gambier (C)	67 Port Augusta (C)
17 Copper Coast (DC)	43 Wattle Range (DC) - East	67 Port Augusta (C)
18 Yorke Peninsula (DC) - North	44 Wattle Range (DC) - West	68 Unincorp. Flinders Ranges
19 Yorke Peninsula (DC) - South	45 Cleve (DC)	69 Anangu Pitjantjatjara (AC)
20 Unincorp. Yorke	46 Elliston (DC)	70 Coober Pedy (DC)
21 Clare and Gilbert Valleys (DC)	47 Franklin Harbour (DC)	71 Maralinga Tjarutja (AC)
22 Goyder (DC)	48 Kimba (DC)	72 Roxby Downs (M)
23 Wakefield (DC)	49 Le Hunte (DC)	73 Unincorp. Far North
24 Berri & Barmera (DC) - Barmera	50 Lower Eyre Peninsula (DC)	74 Metro Adelaide
25 Berri & Barmera (DC) - Berri	51 Port Lincoln (C)	
26 Loxton Waikerie (DC) - East	52 Tumby Bay (DC)	