Section 3

Cancer incidence, stage and survival by region of South Australia: An analysis of supplementary data for selected cancers

In this section …

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Introduction

The information in this Section is based on a report provided by the SA Cancer Registry. A full copy of that report is at Appendix D.

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.[3, 4] 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.[4] 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.[5] 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.[5] 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.[5] 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.[6]

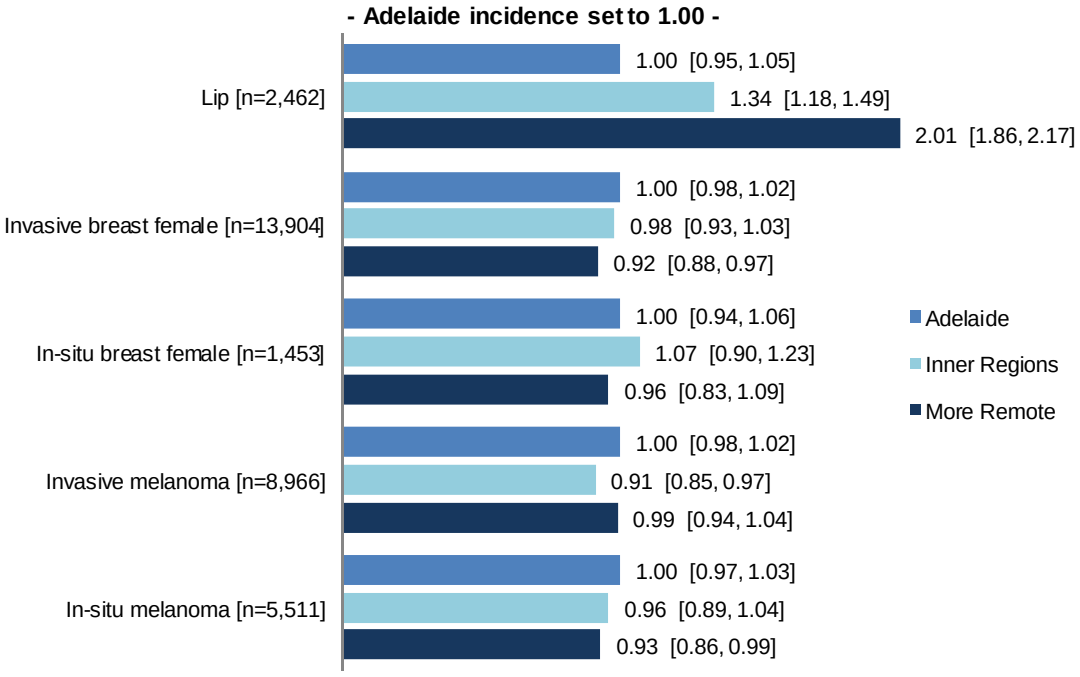
To complement the data compiled by PHIDU in this atlas, Cancer Council South Australia (CCSA) requested data from the SA Cancer Registry on the incidence of certain cancers, stage of progression at diagnosis and survival by residential area of South Australia. Registry data were analysed for the 1995-2008 diagnostic period for Adelaide, Inner Regions and More Remote areas (Outer Regional, Remote and Very Remote areas combined), using the Australian Standard Geographical Classification. The full paper (including details of the methodology) is contained in Appendix D.

Findings

Incidence

The mean annual age-standardised incidence rate (ASR) for lip cancer was higher for people living in Inner Regions and More Remote areas than in Adelaide, with elevations of 34% and 101% respectively. The approximate two-fold elevation for More Remote areas is consistent with elevations observed in previous Registry reports.[3, 5, 10]

Figure 57: Mean annual age-standardised incidence (95% CLs); South Australia, 1995–2008*



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

Non-melanoma skin cancers (NMSC, i.e., basal and squamous cell carcinomas) are not recorded by the Registry but elevations in their ASR have 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 of an elevated NMSC ASR as well. These cancers are rarely a cause of death, but they are the leading cause of hospitalisations 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.

By comparison, 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.

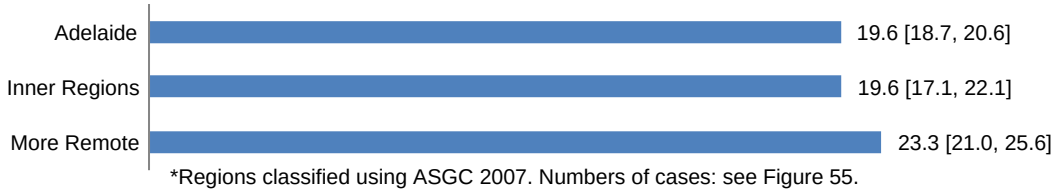
Apart from a lower invasive melanoma incidence in Inner Regions than in Adelaide (9% lower), there were no other statistically significant differences in incidence by region.

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%) . 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).

Figure 58: Percentage of invasive females breast cancers of large size (diameters 30+mm) (95% CLs); South Australia, 1995–2008*



*Regions classified using ASGC 2007. Numbers of cases: see Figure 55.

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 BreastScreen target group of 50-69 year olds (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.

There was no 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. 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>0.250), including in the 50-69 year screening target (p=0.508).

Figure 59: Percentage of invasive breast cancers detected at in-situ stage (95% CLs); South Australia, 1995–2008*

*Regions classified using ASGC 2007. Numbers of cases: see Figure 55. In-situ % estimated from 15,357 cases.

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.

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). Confidences intervals overlapped and differences were not statistically significant (p>0.05). However when a more detailed analysis was undertaken of thickness (<=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). This indicates the need to give special attention to these localities when promoting early detection.

Figure 60: 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 55

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. 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). No differences were found within individual age categories (p>0.189).

Figure 61: Percentage of melanomas detected at in-situ stage (95% CLs); South Australia, 1995–2008*

*Regions classified using ASGC 2007. Numbers of cases: see Figure 55 In -situ % estimated from 14,477 cases.

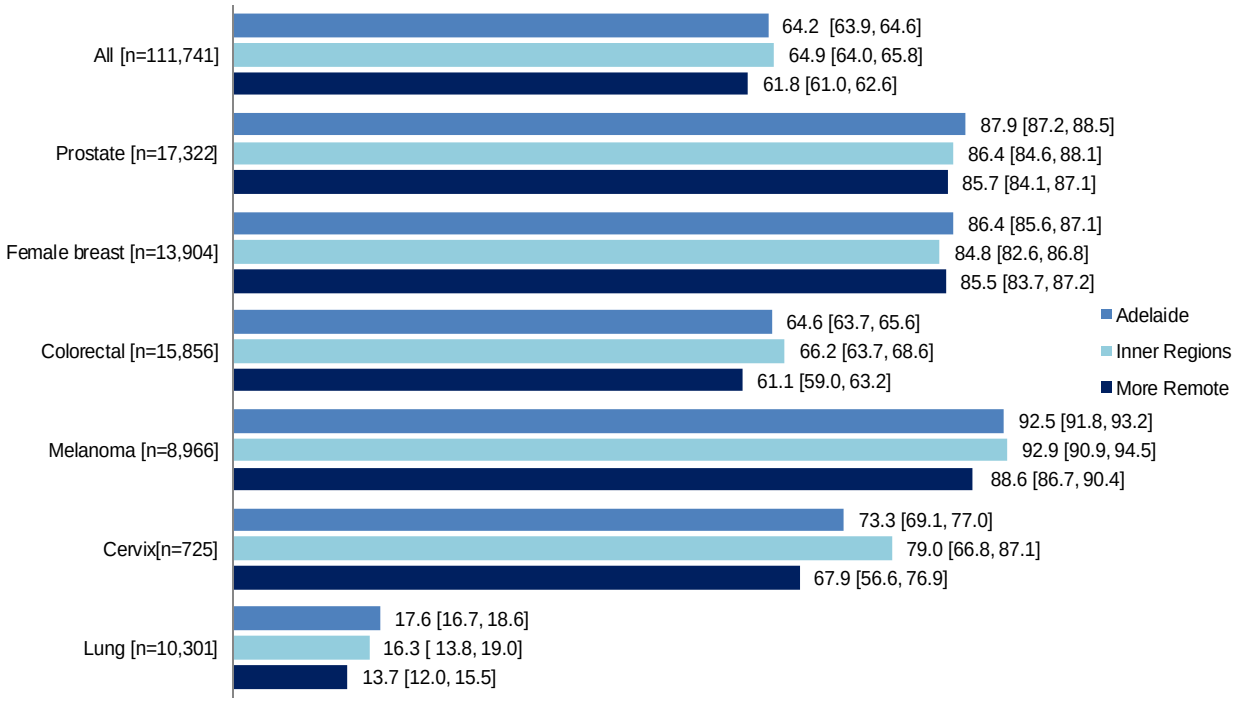
Survival

Survivals from cancer are high in South Australia by world standards with 5-year survivals for all cancers collectively of 61% for 1997-2003. This is similar to the leading survival figure of 63% reported for USA centres for an equivalent diagnostic period and greatly exceeds the corresponding 48% survival for Europe.

Case survivals for all cancers combined were a little lower for people living in in More Remote areas than in Adelaide, both at five years from diagnosis (62% compared with 64%) and at 10 years (58% compared with 60%). These were influenced by poorer survivals from cancers of the female breast (86.4% compared with 85.5%), colon/rectum (61.1% compared with 64.6%), prostate (85.7% compared with 87.9%), skin (melanoma) (88.6% compared with 92.5%) and lung (13.7% compared with 17.6%). Similar findings have been reported nationally.

These differences, while potentially of little importance in public health terms, were probably real, in that 95% confidence intervals did not overlap. 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.

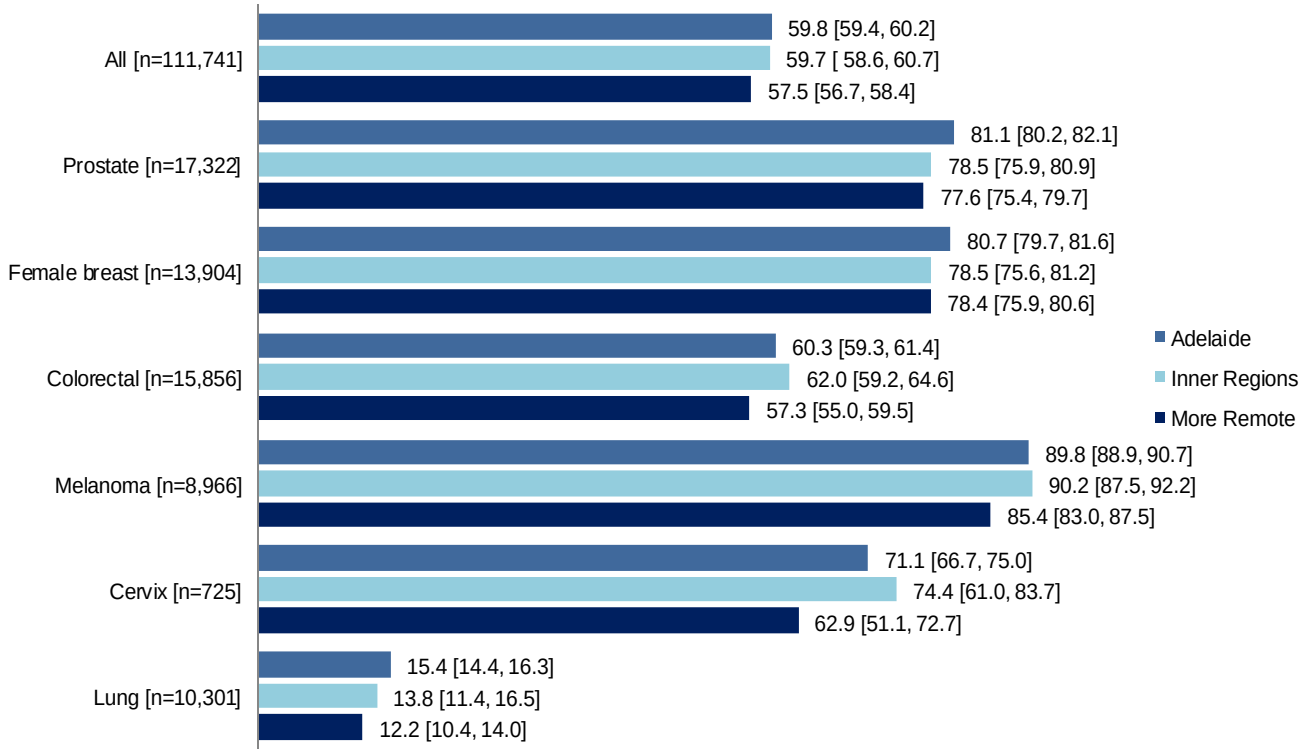
Figure 62: Percentage 5-year survival (95% CLs); South Australia, 1995–2008*



* 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% compared with 59.8%) and cancers of the prostate (77.6% compared with 81.1%), skin (melanoma) (85.4% compared with 89.8%) and lung (12.2% compared with 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. 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 63: 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 x and y ($p<0.05$). 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% Confidence Limits (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.[3, 5, 10] 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).[5] While these cancers rarely are a cause of death,[4] they account for more hospital admissions in Australia than any other cancer type.[6] 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.[11] 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.[11]

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.[11, 12]

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% compared with 64%) and at 10 years (58% compared with 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.[11]

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.

Sources of information

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Section 4

Correlation analysis

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- Results

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Introduction

A correlation analysis has been undertaken to illustrate the extent of association at the SLA level between the indicators in this Atlas. Separate analyses were undertaken for Metropolitan Adelaide and non-metropolitan areas.

The results of the correlation analysis are shown in the following tables. As a general rule, correlation coefficients of plus or minus 0.71 or above are of substantial statistical significance, because this higher value represents at least fifty per cent shared variation (r^2 greater than or equal to 0.5): these are referred to as being 'very strong' correlations, while those of 0.50 to 0.70 are of meaningful statistical significance, and are referred to as being 'strong' correlations. Correlations from plus or minus 0.30 to less than 0.50 are referred to in the text as being 'moderate'; and those just below plus or minus 0.30 are referred to as 'weak'.

Readers should note that correlations between socioeconomic disadvantage (as measured by the IRSD) and poor health outcomes (e.g., high rates of premature death) appear in the matrix as negative numbers. This occurs because low numbers (under 1000) indicate high levels of relative socioeconomic disadvantage under the IRSD and high numbers (above 1000) indicate low levels of relative socioeconomic disadvantage.

Results

Metropolitan Adelaide

Socioeconomic status

The correlation analysis showed there to be

- very strong associations at the SLA level between socioeconomic disadvantage and:
  - lung cancer incidence for males and females (inverse correlations of -0.78 and -0.74, respectively);
  - premature deaths from all cancers (-0.77);
- strong associations between socioeconomic disadvantage; and
  - high grade abnormalities detected through cervical screening;
  - premature deaths from lung cancer for males and females;
- very strong associations between socioeconomic advantage; and
  - cervical cancer participation rates (0.77);
- strong associations between socioeconomic advantage; and
  - breast screening participation rates (0.56);
  - prostate cancer incidence (0.50).

Screening

There is a weak correlation (0.28) between participation in breast cancer screening and breast cancer incidence.

For cervical screening the association between high rates of participation and abnormalities detected is inverse for both low grade (-0.07) and high grade (-0.45) abnormalities. This is not to say that cancers were not detected as a result of screening, but that they were not consistently found among women in areas with high rates of participation in screening.

Participation in screening in the National Bowel Cancer Screening Program is strongly associated with high socioeconomic status for males (0.64) and very strongly associated for females (0.71). Poorer outcomes (i.e., high rates of positive faecal occult blood test results) are strongly correlated at the SLA level with socioeconomic disadvantage, a correlation coefficient of -0.62.

Incidence

Lung cancer incidence among males is very strongly correlated with the risk factor estimates for males smoking (0.80), physical inactivity (0.76) and (inversely) with the population meeting the recommended levels of fruit consumption (-0.71) and with premature deaths from all cancers (0.74)

and lung cancer (0.77). There is also a strong correlation with obesity among males (0.52) and a strong inverse correlation with overweight males (-0.68).

For females with lung cancer, the only very strong correlations are with smoking (0.74) and premature deaths from lung cancer (0.75). There were strong correlations with physical activity (0.69), obesity among females (0.66) and premature deaths from all cancers (0.69).

The incidence of prostate cancer has few correlations of note, the strongest being an inverse correlation with physical inactivity (-0.51); there are also inverse correlations with premature deaths from all cancers (-0.33) and, for males, from all causes (-0.42).

There were only moderate to weak correlations for incidence of melanomas of the skin.

Non-metropolitan areas

Correlation coefficients are generally lower (indicating weaker associations) in non-metropolitan areas, in part as a result of the smaller populations at the SLA level.

Socioeconomic status

There were no strong or very strong associations between socioeconomic disadvantage and the data for cancer screening, cancer incidence or for cancer mortality. However, participation in cervical cancer screening was strongly correlated at the SLA level with socioeconomic advantage (0.56).

Screening

There were strong associations at the SLA level between high rates of high level abnormalities from cervical cancer screening and areas with high rates of breast cancer incidence, lung cancer incidence (for males and females), and deaths of females from lung cancer (and a very strong association with deaths of males from lung cancer).

Incidence

Other than the associations between incidence and cervical cancer screening noted above there were no strong or very strong associations.

Table 31: Correlation matrix, Metropolitan Adelaide

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36
V1	1.00	-0.88	-0.87	-0.88	-0.26	-0.94	0.86	-0.58	0.19	-0.82	0.25	0.69	0.56	0.77	-0.54	-0.15	0.64	0.71	-0.62	-0.15	-0.11	-0.16	0.39	-0.20	-0.78	-0.74	0.50	0.30	0.33	-0.84	-0.83	-0.77	-0.14	-0.10	-0.63	-0.62
V2	-0.88	1.00	0.98	1.00	0.51	0.90	-0.82	0.66	-0.04	0.89	-0.10	-0.91	-0.55	-0.87	0.46	0.01	-0.57	-0.74	0.56	0.10	0.01	0.17	-0.40	0.26	0.80	0.68	-0.42	-0.40	-0.36	0.75	0.74	0.77	0.10	0.10	0.63	0.64
V3	-0.87	0.98	1.00	0.99	0.58	0.86	-0.78	0.67	0.09	0.89	-0.06	-0.92	-0.57	-0.84	0.53	0.00	-0.51	-0.73	0.59	0.14	0.08	0.25	-0.33	0.22	0.80	0.74	-0.37	-0.40	-0.36	0.73	0.74	0.77	0.17	0.04	0.62	0.68
V4	-0.88	1.00	0.99	1.00	0.54	0.89	-0.81	0.66	0.01	0.89	-0.09	-0.92	-0.56	-0.86	0.49	0.01	-0.55	-0.74	0.58	0.12	0.04	0.21	-0.37	0.25	0.80	0.71	-0.40	-0.40	-0.36	0.75	0.75	0.78	0.13	0.08	0.63	0.66
V5	-0.26	0.51	0.58	0.54	1.00	0.20	-0.19	0.40	0.55	0.43	0.14	-0.65	-0.23	-0.30	0.35	0.04	0.12	-0.12	0.33	0.34	0.30	0.45	0.15	0.25	0.36	0.36	0.08	0.04	0.09	0.24	0.18	0.30	0.00	-0.05	0.10	0.32
V6	-0.94	0.90	0.86	0.89	0.20	1.00	-0.84	0.66	-0.19	0.84	-0.26	-0.72	-0.54	-0.78	0.38	0.04	-0.64	-0.76	0.56	0.08	-0.03	0.08	-0.49	0.23	0.76	0.69	-0.51	-0.35	-0.42	0.76	0.78	0.75	0.15	0.08	0.65	0.59
V7	0.86	-0.82	-0.78	-0.81	-0.19	-0.84	1.00	-0.47	0.40	-0.67	0.21	0.75	0.52	0.77	-0.40	-0.12	0.69	0.76	-0.46	0.01	0.00	-0.08	0.38	-0.13	-0.68	-0.61	0.46	0.43	0.28	-0.77	-0.77	-0.71	-0.03	-0.22	-0.67	-0.58
V8	-0.58	0.66	0.67	0.66	0.40	0.66	-0.47	1.00	0.15	0.63	-0.23	-0.59	-0.36	-0.50	0.31	-0.06	-0.29	-0.57	0.44	0.17	-0.04	0.14	-0.22	0.10	0.52	0.62	-0.22	-0.27	-0.37	0.41	0.43	0.45	0.06	-0.15	0.36	0.43
V9	0.19	-0.04	0.09	0.01	0.55	-0.19	0.40	0.15	1.00	0.04	0.17	-0.09	0.14	0.29	-0.06	-0.28	0.46	0.32	0.12	0.20	0.12	0.25	0.23	-0.08	-0.02	0.05	0.28	0.11	-0.03	-0.33	-0.28	-0.15	0.13	-0.31	-0.21	0.02
V10	-0.82	0.89	0.89	0.89	0.43	0.84	-0.67	0.63	0.04	1.00	-0.18	-0.76	-0.53	-0.79	0.42	0.12	-0.48	-0.62	0.56	0.20	0.07	0.23	-0.27	0.23	0.74	0.66	-0.37	-0.29	-0.30	0.69	0.68	0.76	0.22	0.06	0.60	0.57
V11	0.25	-0.10	-0.06	-0.09	0.14	-0.26	0.21	-0.23	0.17	-0.18	1.00	-0.07	-0.05	0.03	0.03	-0.07	0.14	0.18	-0.14	-0.13	-0.05	-0.03	-0.05	-0.03	-0.03	-0.08	0.16	-0.10	-0.09	-0.15	-0.09	0.00	-0.06	0.14	0.04	0.00
V12	0.69	-0.91	-0.92	-0.92	-0.65	-0.72	0.75	-0.59	-0.09	-0.76	-0.07	1.00	0.50	0.77	-0.40	0.09	0.41	0.69	-0.45	-0.11	0.00	-0.26	0.29	-0.21	-0.71	-0.63	0.24	0.42	0.29	-0.58	-0.63	-0.69	-0.11	-0.10	-0.56	-0.62
V13	0.56	-0.55	-0.57	-0.56	-0.23	-0.54	0.52	-0.36	0.14	-0.53	-0.05	0.50	1.00	0.68	-0.36	-0.08	0.51	0.54	-0.37	0.03	0.06	0.00	0.28	0.11	-0.48	-0.55	0.24	0.40	0.18	-0.63	-0.57	-0.55	0.02	0.03	-0.45	-0.49
V14	0.77	-0.87	-0.84	-0.86	-0.30	-0.78	0.77	-0.50	0.29	-0.79	0.03	0.77	0.68	1.00	-0.45	-0.07	0.72	0.75	-0.45	-0.04	-0.01	-0.13	0.40	-0.20	-0.67	-0.64	0.32	0.49	0.32	-0.76	-0.73	-0.76	-0.07	-0.19	-0.59	-0.64
V15	-0.54	0.46	0.53	0.49	0.35	0.38	-0.40	0.31	-0.06	0.42	0.03	-0.40	-0.36	-0.45	1.00	0.29	-0.33	-0.40	0.28	0.28	0.30	0.34	0.06	0.18	0.45	0.40	-0.10	-0.15	-0.08	0.55	0.44	0.43	0.16	-0.02	0.32	0.29
V16	-0.15	0.01	0.00	0.01	0.04	0.04	-0.12	-0.06	-0.28	0.12	-0.07	0.09	-0.08	-0.07	0.29	1.00	-0.12	0.04	-0.06	0.19	0.27	0.17	-0.01	0.11	0.06	0.06	-0.05	0.12	0.33	0.30	0.18	0.17	0.12	0.12	0.21	-0.09
V17	0.64	-0.57	-0.51	-0.55	0.12	-0.64	0.69	-0.29	0.46	-0.48	0.14	0.41	0.51	0.72	-0.33	-0.12	1.00	0.71	-0.31	0.13	0.00	0.05	0.33	-0.16	-0.50	-0.47	0.42	0.56	0.38	-0.72	-0.60	-0.58	0.01	-0.23	-0.50	-0.42
V18	0.71	-0.74	-0.73	-0.74	-0.12	-0.76	0.76	-0.57	0.32	-0.62	0.18	0.69	0.54	0.75	-0.40	0.04	0.71	1.00	-0.41	0.10	0.10	-0.01	0.38	-0.16	-0.57	-0.56	0.48	0.53	0.43	-0.64	-0.61	-0.62	-0.03	-0.09	-0.62	-0.47
V19	-0.62	0.56	0.59	0.58	0.33	0.56	-0.46	0.44	0.12	0.56	-0.14	-0.45	-0.37	-0.45	0.28	-0.06	-0.31	-0.41	1.00	0.13	0.03	0.10	-0.10	0.18	0.51	0.52	-0.40	-0.17	-0.37	0.46	0.37	0.38	-0.19	-0.10	0.26	0.24
V20	-0.15	0.10	0.14	0.12	0.34	0.08	0.01	0.17	0.20	0.20	-0.13	-0.11	0.03	-0.04	0.28	0.19	0.13	0.10	0.13	1.00	0.47	0.83	0.24	0.38	0.26	0.31	0.46	0.46	0.15	0.16	0.17	0.21	0.13	0.08	0.08	0.07
V21	-0.11	0.01	0.08	0.04	0.30	-0.03	0.00	-0.04	0.12	0.07	-0.05	0.00	0.06	-0.01	0.30	0.27	0.00	0.10	0.03	0.47	1.00	0.77	0.60	0.44	-0.06	0.16	0.17	0.15	0.44	0.18	0.14	0.13	0.16	0.13	-0.14	0.15
V22	-0.16	0.17	0.25	0.21	0.45	0.08	-0.08	0.14	0.25	0.23	-0.03	-0.26	0.00	-0.13	0.34	0.17	0.05	-0.01	0.10	0.83	0.77	1.00	0.46	0.48	0.19	0.33	0.38	0.21	0.28	0.18	0.21	0.26	0.23	0.13	0.06	0.22
V23	0.39	-0.40	-0.33	-0.37	0.15	-0.49	0.38	-0.22	0.23	-0.27	-0.05	0.29	0.28	0.40	0.06	-0.01	0.33	0.38	-0.10	0.24	0.60	0.46	1.00	0.22	-0.45	-0.30	0.27	0.15	0.40	-0.25	-0.39	-0.30	0.03	0.04	-0.48	-0.28
V24	-0.20	0.26	0.22	0.25	0.25	0.23	-0.13	0.10	-0.08	0.23	-0.03	-0.21	0.11	-0.20	0.18	0.11	-0.16	-0.16	0.18	0.38	0.44	0.48	0.22	1.00	0.20	0.13	-0.24	0.13	0.03	0.25	0.16	0.24	-0.08	0.46	0.10	0.13
V25	-0.78	0.80	0.80	0.80	0.36	0.76	-0.68	0.52	-0.02	0.74	-0.03	-0.71	-0.48	-0.67	0.45	0.06	-0.50	-0.57	0.51	0.26	-0.06	0.19	-0.45	0.20	1.00	0.69	-0.31	-0.24	-0.54	0.74	0.76	0.74	0.12	0.18	0.77	0.64
V26	-0.74	0.68	0.74	0.71	0.36	0.69	-0.61	0.62	0.05	0.66	-0.08	-0.63	-0.55	-0.64	0.40	0.06	-0.47	-0.56	0.52	0.31	0.16	0.33	-0.30	0.13	0.69	1.00	-0.17	-0.28	-0.33	0.64	0.69	0.69	0.18	-0.02	0.59	0.75
V27	0.50	-0.42	-0.37	-0.40	0.08	-0.51	0.46	-0.22	0.28	-0.37	0.16	0.24	0.24	0.32	-0.10	-0.05	0.42	0.48	-0.40	0.46	0.17	0.38	0.27	-0.24	-0.31	-0.17	1.00	0.25	0.28	-0.42	-0.33	-0.33	0.09	-0.19	-0.30	-0.19
V28	0.30	-0.40	-0.40	-0.40	0.04	-0.35	0.43	-0.27	0.11	-0.29	-0.10	0.42	0.40	0.49	-0.15	0.12	0.56	0.53	-0.17	0.46	0.15	0.21	0.15	0.13	-0.24	-0.28	0.25	1.00	0.44	-0.29	-0.26	-0.28	-0.08	0.07	-0.31	-0.42
V29	0.33	-0.36	-0.36	-0.36	0.09	-0.42	0.28	-0.37	-0.03	-0.30	-0.09	0.29	0.18	0.32	-0.08	0.33	0.38	0.43	-0.37	0.15	0.44	0.28	0.40	0.03	-0.54	-0.33	0.28	0.44	1.00	-0.28	-0.27	-0.36	-0.03	-0.04	-0.50	-0.26
V30	-0.84	0.75	0.73	0.75	0.24	0.76	-0.77	0.41	-0.33	0.69	-0.15	-0.58	-0.63	-0.76	0.55	0.30	-0.72	-0.64	0.46	0.16	0.18	0.18	-0.25	0.25	0.74	0.64	-0.42	-0.29	-0.28	1.00	0.84	0.85	0.12	0.25	0.69	0.55
V31	-0.83	0.74	0.74	0.75	0.18	0.78	-0.77	0.43	-0.28	0.68	-0.09	-0.63	-0.57	-0.73	0.44	0.18	-0.60	-0.61	0.37	0.17	0.14	0.21	-0.39	0.16	0.76	0.69	-0.33	-0.26	-0.27	0.84	1.00	0.86	0.31	0.23	0.68	0.72
V32	-0.77	0.77	0.77	0.78	0.30	0.75	-0.71	0.45	-0.15	0.76	0.00	-0.69	-0.55	-0.76	0.43	0.17	-0.58	-0.62	0.38	0.21	0.13	0.26	-0.30	0.24	0.74	0.69	-0.33	-0.28	-0.36	0.85	0.86	1.00	0.36	0.31	0.77	0.67
V33	-0.14	0.10	0.17	0.13	0.00	0.15	-0.03	0.06	0.13	0.22	-0.06	-0.11	0.02	-0.07	0.16	0.12	0.01	-0.03	-0.19	0.13	0.16	0.23	0.03	-0.08	0.12	0.18	0.09	-0.08	-0.03	0.12	0.31	0.36	1.00	-0.04	0.19	0.21
V34	-0.10	0.10	0.04	0.08	-0.05	0.08	-0.22	-0.15	-0.31	0.06	0.14	-0.10	0.03	-0.19	-0.02	0.12	-0.23	-0.09	-0.10	0.08	0.13	0.13	0.04	0.46	0.18	-0.02	-0.19	0.07	-0.04	0.25	0.23	0.31	-0.04	1.00	0.26	0.14
V35	-0.63	0.63	0.62	0.63	0.10	0.65	-0.67	0.36	-0.21	0.60	0.04	-0.56	-0.45	-0.59	0.32	0.21	-0.50	-0.62	0.26	0.08	-0.14	0.06	-0.48	0.10	0.77	0.59	-0.30	-0.31	-0.50	0.69	0.68	0.77	0.19	0.26	1.00	0.55
V36	-0.62	0.64	0.68	0.66	0.32	0.59	-0.58	0.43	0.02	0.57	0.00	-0.62	-0.49	-0.64	0.29	-0.09	-0.42	-0.47	0.24	0.07	0.15	0.22	-0.28	0.13	0.64	0.75	-0.19	-0.42	-0.26	0.55	0.72	0.67	0.21	0.14	0.55	1.00

V1 IRSD
V2 Smokers - males
V3 Smokers - females
V4 Smokers - persons
V5 Alcohol use - high risk to heal
V6 Physical inactivity
V7 Overweight - males
V8 Obese - males
V9 Overweight - females
V10 Obese - females
V11 Fruit consumtion - 5-17yrs
V12 Fruit consumtion - 18+years
V13 Breast screen participation
V14 Cervical screen participation
V15 Outcome - high grade abnormalities
V16 Outcome - low grade abnormalities
V17 Bowel screen participation - males
V18 Bowel screen participation - females
V19 Outcome - positive FOBT result
V20 All cancers incidence - males
V21 All cancers incidence - females
V22 All cancers incidence - persons
V23 Breast cancer incidence
V24 Colorectal cancer incidence
V25 Lung cancer incidence - males
V26 Lung cancer incidence - females
V27 Prostate cancer incidence
V28 Skin cancer incidence - males
V29 Skin cancer incidence - females
V30 Total premature deaths - males
V31 Total premature deaths - females
V32 Premature deaths - all cancers
V33 Premature deaths - breast cancers
V34 Premature deaths - colorectal cancers
V35 Premature deaths - lung cancers - males
V36 Premature deaths - lung cancers - females

Table 32: Correlation matrix, non-metropolitan areas

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36
V1	1.00	-0.88	-0.77	-0.90	0.01	-0.79	0.74	-0.43	0.17	-0.53	0.14	0.73	0.22	0.56	-0.18	-0.07	0.54	0.56	-0.20	0.24	0.05	0.21	0.14	0.25	-0.15	-0.18	0.32	0.19	0.04	-0.62	-0.65	-0.12	0.07	0.01	-0.26	-0.14
V2	-0.88	1.00	0.68	0.90	-0.02	0.75	-0.65	0.54	-0.31	0.48	-0.09	-0.77	0.04	-0.42	0.36	0.39	-0.19	-0.17	0.23	-0.05	0.04	-0.06	0.00	-0.07	0.22	0.30	-0.19	-0.11	-0.04	0.62	0.53	0.19	-0.17	-0.07	0.28	0.19
V3	-0.77	0.68	1.00	0.93	0.48	0.74	-0.48	0.41	-0.02	0.59	-0.23	-0.55	-0.02	-0.21	0.35	0.22	-0.22	-0.33	-0.03	0.19	0.15	0.18	0.12	0.00	0.44	0.34	0.05	0.06	0.26	0.66	0.39	0.27	-0.07	0.02	0.41	0.32
V4	-0.90	0.90	0.93	1.00	0.28	0.82	-0.61	0.51	-0.17	0.58	-0.17	-0.71	0.01	-0.34	0.40	0.32	-0.25	-0.29	0.10	0.09	0.12	0.08	0.07	-0.02	0.37	0.35	-0.08	-0.03	0.13	0.70	0.51	0.26	-0.13	-0.02	0.39	0.28
V5	0.01	-0.02	0.48	0.28	1.00	0.11	0.23	-0.05	0.03	0.12	-0.21	0.08	-0.35	0.02	-0.07	-0.30	-0.23	-0.01	-0.22	0.13	0.12	0.17	-0.14	0.34	0.16	0.00	0.05	-0.09	0.26	0.04	0.19	0.04	0.12	0.04	0.05	0.06
V6	-0.79	0.75	0.74	0.82	0.11	1.00	-0.59	0.67	-0.06	0.66	-0.15	-0.52	0.12	-0.26	0.39	0.32	-0.27	-0.23	0.04	0.26	0.28	0.27	0.14	0.07	0.30	0.30	0.05	0.03	0.21	0.71	0.40	0.46	0.05	0.05	0.42	0.32
V7	0.74	-0.65	-0.48	-0.61	0.23	-0.59	1.00	-0.33	0.14	-0.36	0.13	0.81	-0.14	0.04	-0.35	-0.46	0.05	0.13	-0.05	0.04	-0.03	0.06	-0.09	0.39	0.03	-0.20	-0.01	-0.12	-0.15	-0.50	-0.39	-0.22	0.10	0.02	-0.25	-0.22
V8	-0.43	0.54	0.41	0.51	-0.05	0.67	-0.33	1.00	-0.03	0.56	-0.09	-0.30	0.11	-0.20	0.00	0.06	0.15	0.11	0.04	0.18	0.00	0.10	0.02	-0.11	0.09	0.08	0.24	0.10	-0.02	0.41	0.02	0.24	0.23	0.10	0.08	0.02
V9	0.17	-0.31	-0.02	-0.17	0.03	-0.06	0.14	-0.03	1.00	0.24	0.11	0.44	0.17	0.12	0.33	0.09	-0.03	-0.40	-0.05	0.33	0.46	0.46	0.52	0.03	0.36	0.16	0.35	0.10	0.53	0.05	-0.34	0.40	0.08	-0.15	0.41	0.35
V10	-0.53	0.48	0.59	0.58	0.12	0.66	-0.36	0.56	0.24	1.00	-0.20	-0.31	0.20	-0.04	0.24	0.18	0.01	-0.11	-0.06	0.39	0.26	0.37	0.30	-0.09	0.29	0.30	0.30	0.20	0.30	0.51	0.06	0.40	0.25	0.18	0.29	0.40
V11	0.14	-0.09	-0.23	-0.17	-0.21	-0.15	0.13	-0.09	0.11	-0.20	1.00	0.22	0.31	-0.03	0.13	0.04	-0.18	-0.21	0.58	0.04	0.26	0.17	0.04	0.19	0.14	0.24	-0.09	0.17	-0.02	-0.13	-0.03	0.15	-0.27	-0.25	0.12	0.09
V12	0.73	-0.77	-0.55	-0.71	0.08	-0.52	0.81	-0.30	0.44	-0.31	0.22	1.00	0.01	0.18	-0.19	-0.34	-0.08	0.01	-0.11	0.13	0.28	0.27	0.16	0.37	-0.01	-0.12	0.12	-0.01	0.10	-0.44	-0.38	-0.01	0.11	-0.03	-0.06	0.01
V13	0.22	0.04	-0.02	0.01	-0.35	0.12	-0.14	0.11	0.17	0.20	0.31	0.01	1.00	0.27	0.27	0.21	0.36	0.25	0.10	0.16	0.18	0.18	0.42	0.10	0.04	0.27	0.29	0.21	-0.04	-0.22	-0.22	0.13	0.07	-0.07	0.12	0.21
V14	0.56	-0.42	-0.21	-0.34	0.02	-0.26	0.04	-0.20	0.12	-0.04	-0.03	0.18	0.27	1.00	-0.03	0.20	0.46	0.49	-0.11	0.35	0.08	0.26	0.29	-0.03	-0.03	-0.13	0.36	0.42	0.32	-0.26	-0.40	0.08	0.19	0.15	-0.11	0.07
V15	-0.18	0.36	0.35	0.40	-0.07	0.39	-0.35	0.00	0.33	0.24	0.13	-0.19	0.27	-0.03	1.00	0.61	-0.16	-0.25	0.28	0.24	0.55	0.42	0.54	0.22	0.54	0.62	0.05	-0.18	0.35	0.15	0.20	0.53	-0.19	-0.10	0.80	0.70
V16	-0.07	0.39	0.22	0.32	-0.30	0.32	-0.46	0.06	0.09	0.18	0.04	-0.34	0.21	0.20	0.61	1.00	-0.09	-0.30	0.09	0.27	0.37	0.36	0.40	0.03	0.41	0.45	0.05	0.09	0.39	0.14	-0.02	0.35	-0.28	-0.10	0.51	0.44
V17	0.54	-0.19	-0.22	-0.25	-0.23	-0.27	0.05	0.15	-0.03	0.01	-0.18	-0.08	0.36	0.46	-0.16	-0.09	1.00	0.83	0.04	0.18	-0.33	-0.09	0.18	-0.16	-0.34	-0.11	0.51	0.15	-0.19	-0.54	-0.66	-0.24	0.16	0.15	-0.35	-0.20
V18	0.56	-0.17	-0.33	-0.29	-0.01	-0.23	0.13	0.11	-0.40	-0.11	-0.21	0.01	0.25	0.49	-0.25	-0.30	0.83	1.00	-0.12	0.17	-0.24	-0.06	0.11	0.06	-0.54	-0.26	0.48	0.03	-0.32	-0.63	-0.52	-0.19	0.25	0.30	-0.42	-0.24
V19	-0.20	0.23	-0.03	0.10	-0.22	0.04	-0.05	0.04	-0.05	-0.06	0.58	-0.11	0.10	-0.11	0.28	0.09	0.04	-0.12	1.00	-0.06	-0.01	-0.03	0.12	0.07	0.29	0.20	-0.19	-0.02	-0.09	-0.01	0.17	-0.19	-0.22	-0.30	-0.16	0.00
V20	0.24	-0.05	0.19	0.09	0.13	0.26	0.04	0.18	0.33	0.39	0.04	0.13	0.16	0.35	0.24	0.27	0.18	0.17	-0.06	1.00	0.40	0.89	0.31	0.43	0.31	0.17	0.71	0.48	0.32	-0.13	-0.49	0.34	-0.02	0.36	0.20	0.14
V21	0.05	0.04	0.15	0.12	0.12	0.28	-0.03	0.00	0.46	0.26	0.26	0.28	0.18	0.08	0.55	0.37	-0.33	-0.24	-0.01	0.40	1.00	0.76	0.66	0.44	0.35	0.48	0.05	0.02	0.57	0.03	0.00	0.61	-0.02	-0.05	0.63	0.61
V22	0.21	-0.06	0.18	0.08	0.17	0.27	0.06	0.10	0.46	0.37	0.17	0.27	0.18	0.26	0.42	0.36	-0.09	-0.06	-0.03	0.89	0.76	1.00	0.53	0.54	0.42	0.36	0.48	0.34	0.50	-0.05	-0.35	0.55	-0.02	0.23	0.44	0.39
V23	0.14	0.00	0.12	0.07	-0.14	0.14	-0.09	0.02	0.52	0.30	0.04	0.16	0.42	0.29	0.54	0.40	0.18	0.11	0.12	0.31	0.66	0.53	1.00	0.17	0.30	0.35	0.19	-0.05	0.38	-0.16	-0.20	0.41	0.13	-0.06	0.53	0.57
V24	0.25	-0.07	0.00	-0.02	0.34	0.07	0.39	-0.11	0.03	-0.09	0.19	0.37	0.10	-0.03	0.22	0.03	-0.16	0.06	0.07	0.43	0.44	0.54	0.17	1.00	0.13	0.15	0.13	-0.14	-0.08	-0.30	0.00	0.14	-0.12	0.14	0.18	0.10
V25	-0.15	0.22	0.44	0.37	0.16	0.30	0.03	0.09	0.36	0.29	0.14	-0.01	0.04	-0.03	0.54	0.41	-0.34	-0.54	0.29	0.31	0.35	0.42	0.30	0.13	1.00	0.46	-0.07	0.04	0.49	0.41	0.03	0.43	-0.16	-0.21	0.58	0.42
V26	-0.18	0.30	0.34	0.35	0.00	0.30	-0.20	0.08	0.16	0.30	0.24	-0.12	0.27	-0.13	0.62	0.45	-0.11	-0.26	0.20	0.17	0.48	0.36	0.35	0.15	0.46	1.00	-0.08	0.00	0.21	0.13	0.11	0.51	-0.04	-0.04	0.65	0.70
V27	0.32	-0.19	0.05	-0.08	0.05	0.05	-0.01	0.24	0.35	0.30	-0.09	0.12	0.29	0.36	0.05	0.05	0.51	0.48	-0.19	0.71	0.05	0.48	0.19	0.13	-0.07	-0.08	1.00	0.31	0.11	-0.46	-0.58	-0.05	0.05	0.30	-0.07	-0.08
V28	0.19	-0.11	0.06	-0.03	-0.09	0.03	-0.12	0.10	0.10	0.20	0.17	-0.01	0.21	0.42	-0.18	0.09	0.15	0.03	-0.02	0.48	0.02	0.34	-0.05	-0.14	0.04	0.00	0.31	1.00	0.22	0.11	-0.45	0.04	-0.02	0.12	-0.16	-0.11
V29	0.04	-0.04	0.26	0.13	0.26	0.21	-0.15	-0.02	0.53	0.30	-0.02	0.10	-0.04	0.32	0.35	0.39	-0.19	-0.32	-0.09	0.32	0.57	0.50	0.38	-0.08	0.49	0.21	0.11	0.22	1.00	0.17	-0.11	0.37	0.05	-0.22	0.39	0.39
V30	-0.62	0.62	0.66	0.70	0.04	0.71	-0.50	0.41	0.05	0.51	-0.13	-0.44	-0.22	-0.26	0.15	0.14	-0.54	-0.63	-0.01	-0.13	0.03	-0.05	-0.16	-0.30	0.41	0.13	-0.46	0.11	0.17	1.00	0.46	0.36	-0.07	-0.04	0.24	0.22
V31	-0.65	0.53	0.39	0.51	0.19	0.40	-0.39	0.02	-0.34	0.06	-0.03	-0.38	-0.22	-0.40	0.20	-0.02	-0.66	-0.52	0.17	-0.49	0.00	-0.35	-0.20	0.00	0.03	0.11	-0.58	-0.45	-0.11	0.46	1.00	0.13	-0.02	-0.11	0.26	0.28
V32	-0.12	0.19	0.27	0.26	0.04	0.46	-0.22	0.24	0.40	0.40	0.15	-0.01	0.13	0.08	0.53	0.35	-0.24	-0.19	-0.19	0.34	0.61	0.55	0.41	0.14	0.43	0.51	-0.05	0.04	0.37	0.36	0.13	1.00	0.29	0.28	0.71	0.69
V33	0.07	-0.17	-0.07	-0.13	0.12	0.05	0.10	0.23	0.08	0.25	-0.27	0.11	0.07	0.19	-0.19	-0.28	0.16	0.25	-0.22	-0.02	-0.02	-0.02	0.13	-0.12	-0.16	-0.04	0.05	-0.02	0.05	-0.07	-0.02	0.29	1.00	0.32	-0.07	0.17
V34	0.01	-0.07	0.02	-0.02	0.04	0.05	0.02	0.10	-0.15	0.18	-0.25	-0.03	-0.07	0.15	-0.10	-0.10	0.15	0.30	-0.30	0.36	-0.05	0.23	-0.06	0.14	-0.21	-0.04	0.30	0.12	-0.22	-0.04	-0.11	0.28	0.32	1.00	-0.01	0.03
V35	-0.26	0.28	0.41	0.39	0.05	0.42	-0.25	0.08	0.41	0.29	0.12	-0.06	0.12	-0.11	0.80	0.51	-0.35	-0.42	-0.16	0.20	0.63	0.44	0.53	0.18	0.58	0.65	-0.07	-0.16	0.39	0.24	0.26	0.71	-0.07	-0.01	1.00	0.77
V36	-0.14	0.19	0.32	0.28	0.06	0.32	-0.22	0.02	0.35	0.40	0.09	0.01	0.21	0.07	0.70	0.44	-0.20	-0.24	0.00	0.14	0.61	0.39	0.57	0.10	0.42	0.70	-0.08	-0.11	0.39	0.22	0.28	0.69	0.17	0.03	0.77	1.00

V1 IRSD
V2 Smokers - males
V3 Smokers - females
V4 Smokers - persons
V5 Alcohol use - high risk to heal
V6 Physical inactivity
V7 Overweight - males
V8 Obese - males
V9 Overweight - females
V10 Obese - females
V11 Fruit consumtion - 5-17yrs
V12 Fruit consumtion - 18+years
V13 Breast screen participation
V14 Cervical screen participation
V15 Outcome - high grade abnormalities
V16 Outcome - low grade abnormalities
V17 Bowel screen participation - males
V18 Bowel screen participation - females
V19 Outcome - positive FOBT result
V20 All cancers incidence - males
V21 All cancers incidence - females
V22 All cancers incidence - persons
V23 Breast cancer incidence
V24 Colorectal cancer incidence
V25 Lung cancer incidence - males
V26 Lung cancer incidence - females
V27 Prostate cancer incidence
V28 Skin cancer incidence - males
V29 Skin cancer incidence - females
V30 Total premature deaths - males
V31 Total premature deaths - females
V32 Premature deaths - all cancers
V33 Premature deaths - breast cancers
V34 Premature deaths - colorectal cancers
V35 Premature deaths - lung cancers - males
V36 Premature deaths - lung cancers - females