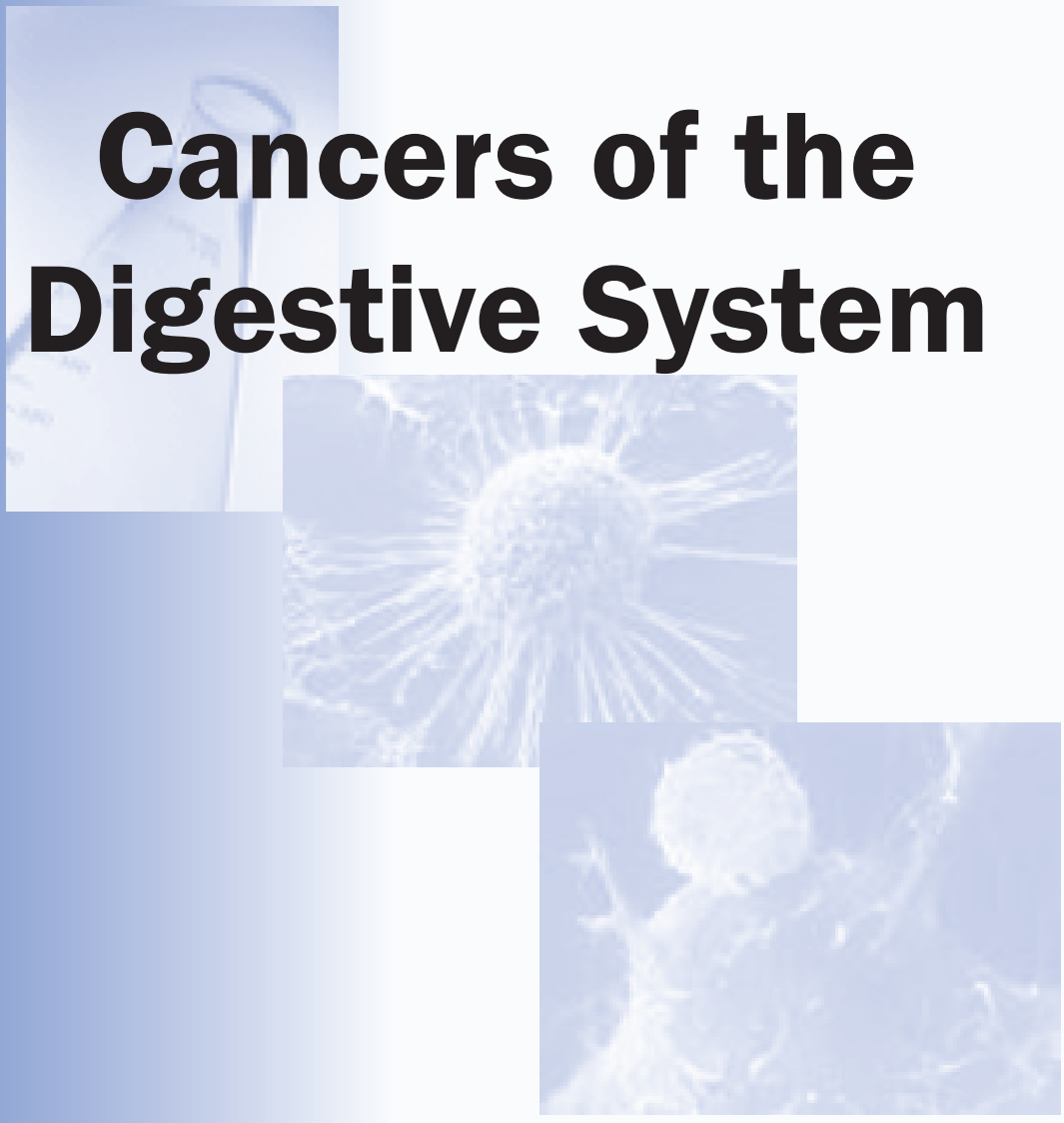
Centre for Cancer Control Research

Monograph Series

South Australian Cancer Statistics

Monograph No 1

Cancers of the Digestive System



ANTI-CANCER FOUNDATION SOUTH AUSTRALIA

November 2001

PREFACE TO

CANCERS OF THE DIGESTIVE SYSTEM

Our publication 'Reducing the impact of Cancer in South Australia' published in 2000, attracted largely favourable comments from its intended audience - the community at large.

A number of people wanted rather more detailed information, particularly about some of the less common cancers, but without a lot of scientific language.

We have decided to produce an 'information series' about cancers which affect various body systems, with this first monograph addressing cancers of the digestive system.

While a few of the words and concepts might be a little difficult for some readers, a glossary is provided and explanations are readily available from our Cancer Help Line on 13 11 20.

The principal author, Dr David Roder, has used several data sources, listed in Appendix A, and compared South Australia with Australia and the rest of the world.

Clearly there are several areas where South Australia is behind and where targeted research might uncover valuable information leading to better cancer control.

Any comments about this monograph and/or suggestions for future publications are welcome.

KERRY KIRKE
Executive Director
November 2001

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ACKNOWLEDGEMENTS:

The South Australian cancer data presented in this monograph were extracted from annual reports published by the SA Cancer Registry, Department of Human Services, for the 1977-99 period. The Foundation is indebted to the Registry for the collection and publication of these data.

The Foundation also is indebted to: the Australian Institute of Health and Welfare for the provision of cancer data for other Australian States and Territories; and the International Association for Research on Cancer and the International Association of Cancer Registries for cancer data for other countries around the world.

Contents

What is happening and what can we do better?

What is happening and what can we do better?

We have chosen these cancers as the topic for our first release of *South Australian Cancer Statistics* because they have received little publicity, are a major burden on the community and are frequently amenable to prevention. It often appears as if they are the *forgotten cancers*.

Yet each year:

- **About 1,600 South Australians get these cancers.**
- **About 880 South Australians die from them, accounting for close to 30% of all cancer deaths (Figure 1).**

These cancers occur either in the: oesophagus; stomach; small intestine; large bowel (colon or rectum); liver or intrahepatic bile ducts; gallbladder or extrahepatic bile ducts; or pancreas, with cancers of the large bowel causing the largest numbers of deaths (Figure 2).

The prospects for better outcomes are good for these cancers through:

- **Prevention** - eg, through:
  - * Eating more fruit and vegetables.
  - * Not smoking.
  - * Not drinking excess alcohol.
  - * Having moderate levels of exercise.
  - * Immunisation and other infection-control measures.
- **Screening** - i.e., through faecal occult blood testing, colonoscopic examinations of high-risk groups, and other early-detection initiatives.
- **Treatment advances** - eg, through adjuvant chemotherapy of moderately advanced large-bowel tumours.
- **Provision of better ongoing support** - Approximately 3,750 South Australians are surviving today with a diagnosis of one of these cancers in the past five years. Many still require ongoing medical attention, and some, broader assistance with their daily lives.

This information series will address the following questions for each of these cancers:

- *How common are they and are they becoming more or less common?*
- *How common are they in South Australia as compared with other parts of the world?*
- *What are the prospects for cure in South Australia as compared with prospects elsewhere, and how is this changing?*
- *What opportunities are there for us to make a difference through prevention or by improving cure rates?*

Source data have been obtained from the public documents listed in Appendix A.

Figure 1: % cancer deaths by tumour site: SA 1995-99

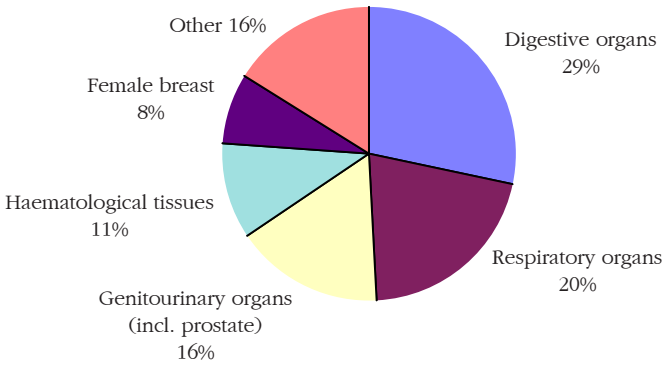
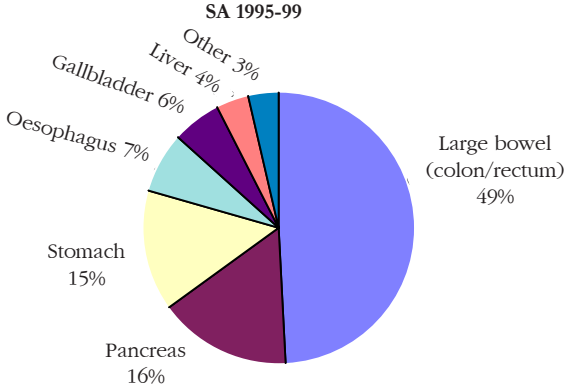


Figure 2: % cancer deaths by digestive-organ tumour site: SA 1995-99



Oesophageal cancers

Introduction:

Because the oesophagus is the section of the digestive tract between the pharynx (throat) and stomach, oesophageal cancers often cause pain and other difficulties when swallowing. Sometimes, especially when advanced, they can cause more general pain in the chest or back, a chronic cough, vomiting, and severe weight loss.

Risk factors:

- **Tobacco smoking** and **excess alcohol consumption** - These are the main risk factors in Australia, although not equally so, with more than four times as many oesophageal cancers being attributed to tobacco as alcohol. **Together, tobacco smoking and excess alcohol consumption would account for at least 60% of cases.** *This offers major scope for prevention.*
- In Asian populations, where oesophageal cancers are very common by Australian standards, risk factors include:
    1. **Poor nutrition**, including deficiencies in carotenoids and vitamin C.
    2. Consuming **pickled foods**, particularly pickled vegetables (nb, pickled according to local Asian customs).
    3. In some areas, repeated swallowing of **betel-nut juices, opium products, chewed tobacco or other caustic substances.**
    4. Possibly very hot foods and drinks.

    While tobacco smoking and alcohol consumption also would cause these cancers in Asia, they are thought to account for only a small proportion in those countries.

Occurrence:

In South Australia:

Between 1995 and 1999:

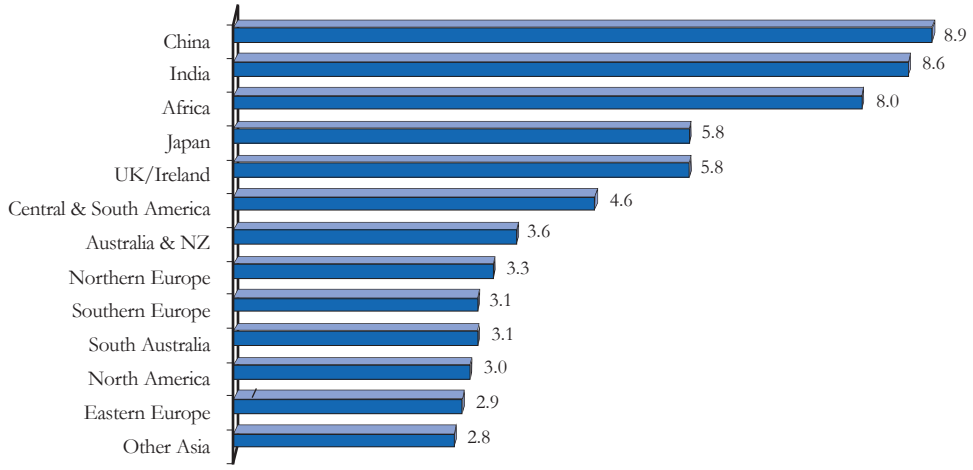
- **About 88 South Australians were diagnosed with oesophageal cancers annually.**
- **About 65 South Australians died from them annually.**
- **Just over 2% of all cancer deaths were due to these cancers.**

More males than females get oesophageal cancers, the ratio being about *1.9 to one* in South Australia. The ratio is influenced by variations in tobacco smoking and alcohol consumption. While deaths usually occur in residents aged 70 years or more, about 8 deaths occur annually in South Australians in their fifties or younger.

In the world:

Oesophageal cancer is the 8th most commonly diagnosed cancer in the world and the 5th leading cause of cancer death. *Figure 3* shows that **South Australia has a low incidence by world standards**. High incidence rates apply to China, India and Africa.

Figure 3: Annual oesophageal cancer incidence per 100,000, circa 1990*



* Age-sex standardized (World Population).

Time trends:

An increase in age-sex standardized annual incidence (new oesophageal cancers per 100,000 residents) of over a quarter took place in South Australia between the 1977-81 and 1997-99 (*Figure 4*). Males and females had similar percentage increases, although the causes probably differed, as follows:

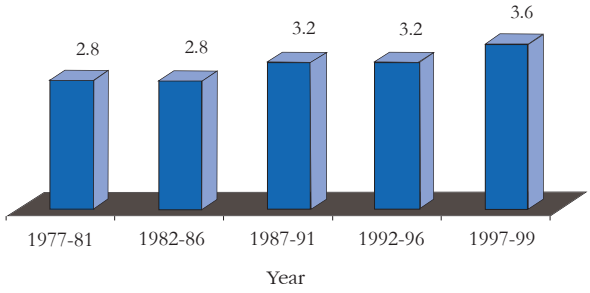
- **The increase for females is attributed to increased tobacco smoking**. (It was accompanied by an increase in lung-cancer incidence.)
- **The increase for males is not smoking related**. An important feature has been the change in cell type from traditional squamous cell lesions to adenocarcinomas (generally in the lower third of the oesophagus). These adenocarcinomas resemble more closely the cells that line the stomach. In 1977-81, just over a third of male oesophageal cancers were adenocarcinomas, as opposed to squamous cell lesions, whereas by 1997-99, this proportion had risen to two thirds. This is change on a scale seldom seen in the cancer field over such a short time period.

Many authorities attribute the change in males to chronic reflux oesophagitis. This entails a back-up of gastric acids, which can cause cellular degeneration and change (i.e., the so-called Barrett's oesophagus). Ultimately, these altered cells can progress to adenocarcinomas Meanwhile, adenocarcinomas remain an uncommon type of female oesophageal cancer, accounting for only about 25% of the total.

The question arises: *"What changes in men's lifestyles or other factors could have led to this change? Can the process be reversed?"*

There are signs that **the increase in incidence of oesophageal cancer in South Australia is losing pace**. There is not, for example, an increase of equivalent magnitude among younger generations to that seen in the older population.

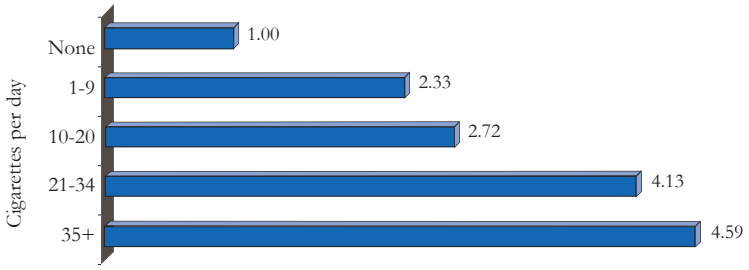
Figure 4: Annual oesophageal cancer incidence per 100,000; SA 1977-99*



*Age-sex standardized (World Population).

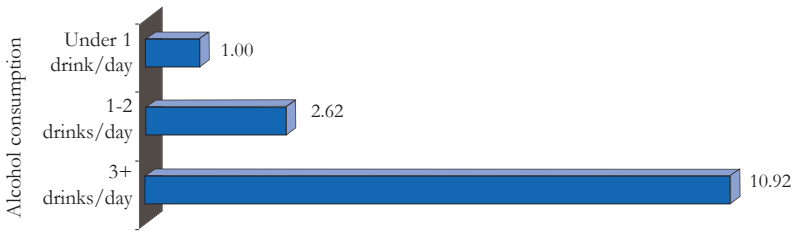
The risk of oesophageal cancer has been shown to increase with increasing tobacco and alcohol consumption, as shown in *Figures 5 and 6*. Other contributors probably would be poor diet, including a low intake of fruit and vegetables, and possibly chronic mucosal irritation from the frequent consumption of very hot foods and drinks.

Figure 5: Relative risk of oesophageal cancer, as related to cigarette consumption*



*Adapted from Wynder and Bross, and Schottenfeld and Fraumeni (Appendix A).

Figure 6: Relative risk of oesophageal cancer, as related to alcohol consumption*



*Adapted from Wynder and Bross, and Schottenfeld and Fraumeni (AppendixA).

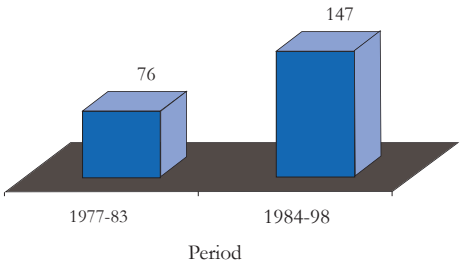
Case outcomes:

Clinical outcomes are poor, with only about 15% of cases surviving five or more years from diagnosis. The survival figures for South Australia are similar to those for other parts of Australia and the USA.

Surgery is the most common treatment provided with curative intent, although radiotherapy and chemotherapy may be used, either with or without surgery. Considerable research is being directed at improving treatment outcomes.

Although outcomes remain unfavourable, there is evidence of gains. For every 1,000 cases diagnosed in South Australia in 1977-83, only 76 survived their cancers five years or more from diagnosis, whereas this figure was almost twice as high for the 1984-98 period (i.e., 147 per 1,000 cases) (*Figure 7*). This is attributed to treatment advances and earlier diagnosis through endoscopy.

Figure7: Numbers per 1,000 cases surviving oesophageal cancer five or more years from diagnosis; SA 1977-98*



*Date of censoring: December 31st, 1998.

Other trends:

Oesophageal cancers have a strong socio-economic gradient. A 20-year study showed the incidence to be 46% higher in the lower than upper socio-economic areas of Adelaide. This is probably due to differences in tobacco smoking and alcohol consumption, although dietary factors may have contributed.

Compared with all occupations in aggregate, incidence rates are about 50% lower among self-employed managers and white-collar workers, and about 80% higher among the unemployed sector of the workforce. This would be due to socio-economic and lifestyle differences, rather than occupational effects as such. By comparison, bartenders have a raised incidence of these cancers, which may reflect their more ready access to alcohol and (potentially) exposures to environmental tobacco smoke.

Aboriginal residents have a higher incidence of these cancers than other South Australians. Females born in the UK/Ireland also have a raised incidence when compared with Australian-born women. This is probably a function of their smoking histories. (Their lung-cancer incidence also is elevated.) Conversely, groups from Southern Europe have a low incidence, less than half that of the Australian-born. This would have been influenced by the infrequency of smoking in women from these countries. (Their incidence of lung cancer is less than half that of Australian-born women.) Also, the Asian-born have an incidence about two thirds lower than the Australian-born. This also accords with their lower incidence of lung cancer.

Cancer control:

Despite treatment advances, the prognosis remains poor for oesophageal cancers. Primary prevention offers the best prospects. This can be achieved by:

- **Not smoking.**
- **Not drinking excess alcohol.**
- **Eating fruit and vegetables.**

Research is required to find reasons for the epidemic of adenocarcinomas of the lower male oesophagus. In the meantime, reflux oesophagitis should be treated promptly, so as to reduce the potential for cellular transformation and cancer development.

Gastric (stomach) cancers

Introduction:

The stomach is located between the oesophagus and small intestine. Cancers of the stomach usually are diagnosed late because they remain asymptomatic or present only vague symptoms often associated with other conditions. Symptoms can include abdominal discomfort, nausea, vomiting, altered bowel habits, a bloating sensation, appetite loss, and fatigue. Advanced disease can cause pronounced pain, together with the vomiting of blood, the passing of blood in the stools, and signs of anaemia.

Risk factors:

- **Poor diet**, including **a deficient intake of fruit and vegetables (particularly of fruit)**. These items have a protective anti-oxidant effect and can inhibit endogenous nitrosation through their vitamin C content and possibly other micronutrients. Additional dietary ingredients that are potentially protective include carotenoids (eg, α-carotene, β-carotene, lycopene, cryptoxanthin and lutein), allium (eg, onions), and whole-grain cereals, and green tea.
- Having a **high intake of salted and (possibly) smoked, cured and/or pickled foods**. These foods can have elevated levels of N-nitroso compounds, or their precursors, which are potent causes of cancer in test animals, and potentially in humans also. A frequent consumption of heavily grilled or barbecued meat and fish also may be a risk factor.
- **Poor access to refrigeration**, with negative effects on diet and food hygiene.
- ***Helicobacter pylori* infection** - This has been strongly implicated in the pathogenesis of gastric cancer. It can cause gastritis, which may progress through metaplastic and dysplastic cellular changes to cancer development.

  While there is some indication of an association of tobacco smoking and alcohol consumption with gastric cancer, the link is more tenuous than for oesophageal cancer, and may be restricted to the cardia sub-site (i.e., the part of the stomach close to the oesophagus).

  An excellent opportunity exists for prevention through dietary improvements. It is estimated that the global burden of gastric cancer could be reduced by up to 50% by *increasing the intake of fruit and vegetables.*

Occurrence:

In South Australia:

Between 1995 and 1999:

- **About 170 South Australians were diagnosed with gastric cancers annually.**
- **About 130 South Australians died from them annually.**
- **Just over 4% of all cancer deaths were due to these cancers.**

  Although deaths mostly occur in people aged 70 years or more, about 20 occur annually in residents in their fifties or younger.

More males than females get gastric cancers, the ratio being about *1.8 to one* in South Australia. This is similar to ratios seen around the world, which begs the question: *Why are males at such a high risk when compared with females?* Partly it may reflect a poorer diet and a contribution from a greater prevalence of tobacco smoking and excess alcohol consumption. But are there other factors involved? The reasons for the higher male-to-female ratio for cardia than other gastric lesions have not been explained.

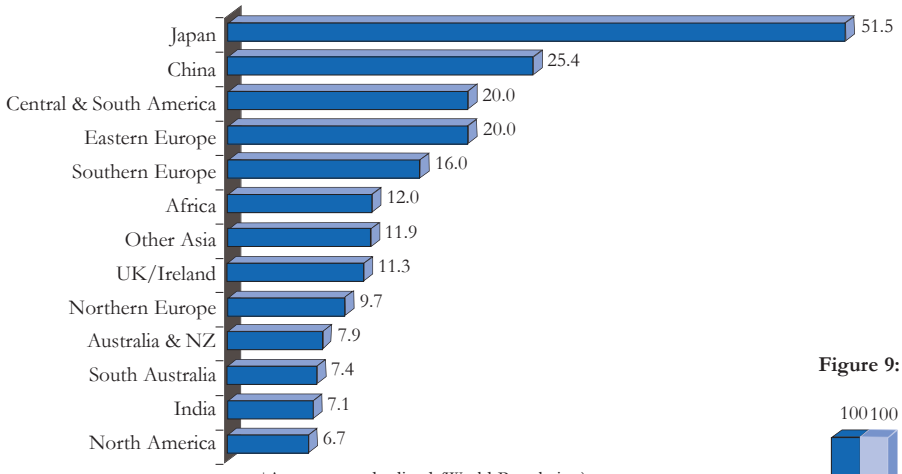
In the world:

While the incidence of gastric cancers has reduced around the world, they remain the 2nd most commonly diagnosed cancers and the 2nd leading cause of cancer death (after lung cancer). **South Australia has a low incidence by world standards** (*Figure 8*). The highest rates by far apply to Japan, probably due to high dietary salt.

Elevations also apply to China, Central and South America, Eastern Europe, and (less so) Southern Europe.

By comparison, low rates apply to most economically developed western countries, such as the USA and Canada, Australia and New Zealand, and Northern European countries. South Australia, in particular, has a low incidence.

Figure 8: Annual gastric cancer incidence per 100,000, circa 1990*



*Age-sex standardized (World Population).

The low incidence in India is puzzling. India's economic and cultural profile is dissimilar to that of other countries with a low incidence. Moreover, a higher incidence might have been expected in India from diets low in fruit and vegetables, limited refrigeration, and a vulnerability to *helicobacter pylori* infection. Wholegrain cereals may be protective for these cancers. This may partly explain the low incidence in India.

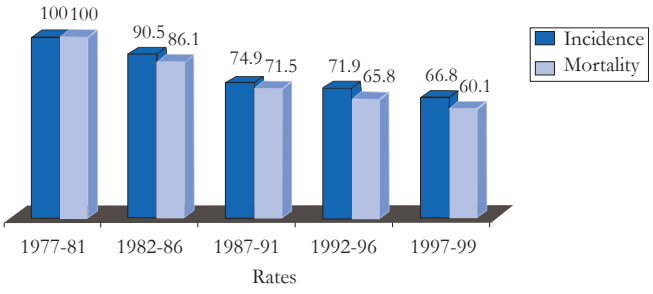
Time trends:

There has been a worldwide decline in age-sex standardized rates of gastric cancer over the past 50 years. **The incidence decline in South Australia approximated 33% between 1977-81 and 1997-99** (*Figure 9*), with males and females being similarly affected. This typifies the scale of reduction seen in many countries. The corresponding **reduction in mortality was higher at 40%**, (*Figure 9*), probably due to an added contribution from increased case survival.

Factors influencing the incidence decrease are thought to include:

- **Dietary improvements**, particularly an increased consumption of fruit and vegetables, and a reduced intake of salted and (probably) pickled, cured and chemically preserved foods.
- **Improvements in refrigeration**. This has facilitated year-round access to vegetables and fruits, while reducing the need for salt as a preservative. Refrigeration also may have reduced exposure to cancer-causing N-nitroso compounds.
- **Reductions in *helicobacter pylori* infection**, due to improved living standards and probably the widespread use of antibiotics.

Figure 9: Annual gastric cancer rates per 100,000; SA 1977-99*



* Age-sex standardized (World Population).
1977-81 baseline set at "100".

In contrast with the decline for gastric cancers in aggregate, an **increased incidence of cardia lesions** has been observed in many populations. This has been linked to a parallel increase in adenocarcinomas of the lower oesophagus, where hyperacidity, reflux oesophagitis, Barrett's oesophagus, and obesity are likely risk factors. The increase in cardia lesions has applied mostly to males. *Why has this happened?*

The reduction in incidence of all gastric cancers in aggregate is losing pace in many populations. In South Australia, as in many other parts of the world, smaller reductions are applying to the younger than older generations. In particular,

residents born after the 1930s are showing lower risk reductions. In general, the increased incidence of cardia lesions, particularly in younger people, is countering the overall incidence decline in many economically developed western populations.

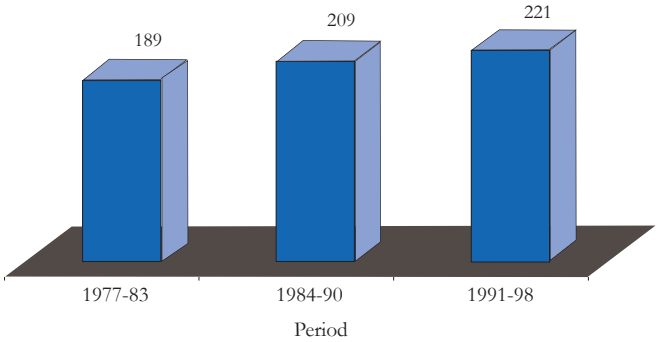
Case outcomes:

Clinical outcomes are poor, although not as poor as for oesophageal cancer, with about 22% of South Australian cases surviving five or more years from diagnosis. South Australian survivals are similar to those for other Australian states and territories, and the USA. Outcomes vary with stage of progression of the disease at diagnosis. NSW data indicate, for example, that the five-year survival is about 50% when the disease is localised at diagnosis, 23% when there is regional spread, and 2% when there is evidence of distant metastases.

The most common treatment is a total or sub-total gastrectomy. Chemotherapy and radiotherapy also may be provided to impede tumour spread. Innovative approaches are being investigated to improve outcomes. In Japan, where there is mass X-ray screening for gastric cancer, five-year survivals of 50% or more have been reported. The benefits of this screening need to be quantified more accurately through randomised trials. Other research is being directed at improving outcomes through immunotherapy, gene therapy, and the use of anti-angiogenesis compounds.

Although outcomes remain poor, there is evidence of modest gains. **The number per 1,000 South Australian cases who survived their cancers five years or more from diagnosis increased from 189 for the 1977-83 diagnostic period to 209 for 1984-90 and 221 for 1991-98** (*Figure 10*). Gains of a similar magnitude have been reported in the USA and attributed to earlier diagnosis from gastroscopy.

Figure 10: Numbers per 1,000 cases surviving gastric cancer five or more years from diagnosis: SA 1977-98



Other trends:

Gastric cancer shows a strong socio-economic gradient. This has been attributed to differences in diet, access to refrigeration, and levels of *helicobacter pylori* infection. In Adelaide during 1977-96, the **incidence was about a third higher in the lower than upper socio-economic areas** (*Figure 11*).

Figure 11: Annual gastric cancer incidence per 100,000 by socio-economic status of residential postcode in Adelaide; 1977-96*

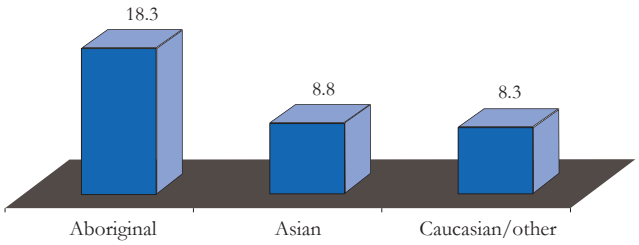
*Age-sex standardized (World Population).

Incidence rates also are **higher in lower socio-economic occupational groups**, such as labourers, cleaners and related workers, and bricklayers and concrete workers, but l**ower among upper socio-economic professionals** such as tertiary qualified teachers and medical practitioners. **Residents of Adelaide have a higher incidence than country residents**, partly due to the residential locations of migrant groups. In general, migrants have an incidence about 60% higher than for the Australian born. **Elevations have applied in particular to migrants from the UK/Ireland and Southern Europe**, which accords with the risk profiles of their countries of origin.

Race also is predictive of risk. **Aboriginal residents have a risk at least twice that of other South Australians** (*Figure 12*). This would be a reflection of their living standards, with poorer access to refrigeration, and with diets characterised by a low content of fruit and vegetables. Asians

have an incidence similar to that of other South Australians, not the higher incidence observed in many Asian countries. This may be due to a self-selection of healthier members of these populations for migration.

Figure 12: Annual gastric cancer incidence per 100,000 by race; SA circa 1977-96*



*Age-sex standardized (World Population).

Cancer control:

Despite gains in case survival, the prognosis remains poor for these cancers. The only exception is Japan, where there is population screening with barium X-ray. This is unlikely to be cost-effective in Australia, unless restricted to sub-groups at an unusually high risk.

Primary prevention offers the best prospects for control of this cancer. This can be achieved by:

- **Eating fruit and vegetables (particularly fruit).**
- **Avoiding high dietary salt.**
- **Acquiring good living standards, with proper use of refrigeration for perishable foods.**

Research is needed to find reasons for the increased incidence of cardia lesions, particularly in males in economically developed western populations. The roles of obesity, hyperacidity, excess alcohol consumption, tobacco smoking and other possible aetiological factors should be investigated.

Cancers of the small intestine

Introduction:

The small intestine lies between the stomach and the large bowel. Cancers of this organ often cause pain or cramps in the mid-abdomen, an abdominal lump, blood in the stools, or unexplained weight loss. Due to their rareness, symptoms are frequently attributed to more common conditions.

The rareness of these lesions is surprising, insofar as the small intestine can range in length from 3.6 to 6.6 metres. While it accounts for about 75% of the gastrointestinal tract (GIT), only 1-2% of GIT cancers originate in this organ. This may be due to the fast transit time of GIT contents through it, together with a relatively low burden of carcinogenic bacteria, secondary bile acids and other carcinogens.

Risk factors:

- Potentially diets **high in animal protein and fat and low in fruit and vegetables**.
- **Inherited predispositions** - eg, Familial Adenomatous Polyposis, a risk of Heriditary Non-Polyposis Colorectal Cancer, and Peutz-Jeghers syndrome.
- **Crohn's disease**

Approximately 40-50% of these tumours are adenocarcinomas and about 35% are carcinoid lesions. The contributions of different aetiological factors likely would vary with the cell type.

Occurrence:

In South Australia:

Between 1995 and 1999:

- **About 15 South Australians were diagnosed with cancers of the small intestine annually.**
- **About 9 South Australians died from them annually.**
- **Approximately one in 327 cancer deaths was due to these cancers.**

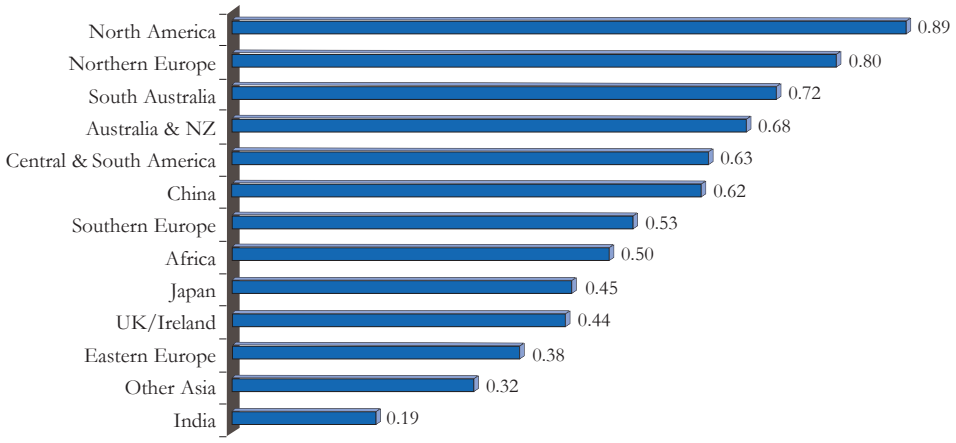
More males than females acquire them, the ratio being 1.5 to one in South Australia. While deaths mostly occur in people aged 70 years or more, around 2 deaths occur annually in residents in their fifties or younger.

In the world:

The **incidence of these cancers in South Australia approximates that for Australia and New Zealand more generally** (*Figure 13*). This is at the high end of the world scale, with only North America and Northern Europe having a higher incidence.

There is a positive geographic correlation between cancers of the small and large bowel (colon/rectum), suggesting common aetiological

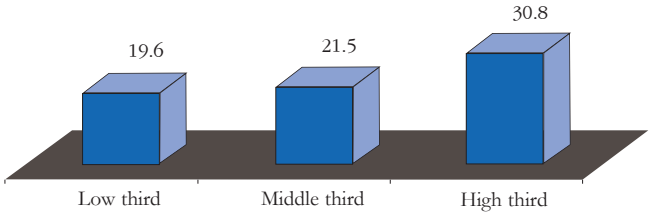
Figure 13: Annual incidence of cancers of the small intestine per 100,000, circa 1990*



*Age-sex standardized (World Population).

factors. This also is evident from the present data (Spearman r=0.6; p=0.05).

Figure 14: Annual incidence of large-bowel (colon/rectum) cancers per 100,000, by region of the World, according to the incidence of cancers of the small intestine, circa 1990*



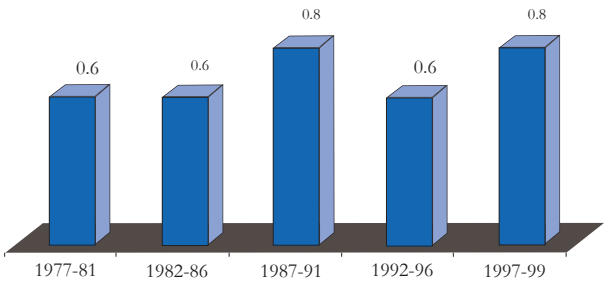
*Age-sex standardized (World Population).

Figure 14 shows a higher incidence of colorectal cancer in regions of the world with an elevated incidence of small-intestine cancers. Common risk factors include traditional western diets low in vegetables and high in animal protein and fat, and a familial predisposition to adenomatous polyps.

Time trends:

The age-sex standardized **incidence of cancers of the small intestine is either stable or trending upwards in South Australia** (*Figure 15*). This is consistent with the international data. Because colorectal cancer incidence has risen in South Australia, an increase for cancers of the small intestine would be expected (given the evidence of a correlation).

Figure 15: Annual incidence of cancers of the small intestine per 100,000; SA 1977-99*



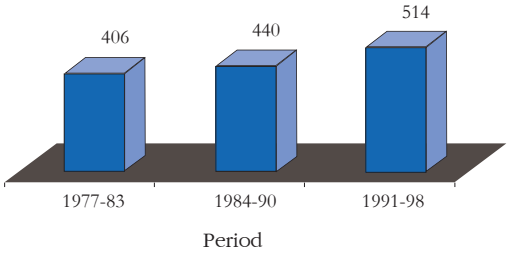
*Age-sex standardized (World Population).

Case outcomes:

Although trend analyses are complicated by small case numbers, South Australian data are indicative of **gains in case survival** (*Figure 16*). Advances in endoscopy are thought to have contributed. USA data show a similar five-year survival to the South Australian figure (i.e., 52% in the USA in 1992-97).

The prospects for cure are best when the tumour is resectable. Unresectable lesions often are given palliative radiation therapy. Innovative treatments of metastatic disease are being investigated, including use of radio-sensitisers to increase the effect of radiotherapy (with or without adjuvant chemotherapy). In South Australia, treatment outcomes tend to be better for younger than older patients, and for tumours originating in the jejunum or ileum, as opposed to the duodenum.

Figure 16: Numbers per 1,000 cases surviving cancers of the small intestine five or more years from diagnosis; SA 1977-98*



*Date of censoring: December 31st, 1998.

Cancer control:

These cancers have not been targeted at a population level, due to their rarity. Still, the following precautions would be appropriate:

- **Eating fruit and vegetables.**
- **Having endoscopic surveillance, where clinically recommended, following an assessment of inherited risk or a history of Crohn's disease.**

Cancers of the large intestine (colon/rectum)

Introduction:

The large intestine is the last section of the gastrointestinal tract after the small intestine. It comprises the colon and rectum, with average lengths of about 1.8 metres and 23 centimetres respectively. Colorectal cancers characteristically cause a change in bowel habits, blood in the stools, vomiting, and sometimes abdominal discomfort or a bloating sensation.

Risk factors:

- Diets **low in vegetables** and potentially **diets high in processed meat and fat.**
- **Excess body weight.**
- **Lack of exercise.**
- **Drinking excess alcohol** (probably).
- **Inherited risk factors** - eg, Familial Adenomatous Polyposis, Peutz-Jeghers syndrome, juvenile polyposis, and Hereditary Non-polyposis Colorectal Cancer. First-degree relatives of people with colorectal cancer are at increased risk. Overall, familial and hereditary factors would account for about 10-15% of these cancers.
- A history of **inflammatory bowel disease** (Crohn's disease or ulcerative colitis).

A link between tobacco smoking and colorectal cancer has not been shown directly, although there is indirect evidence from the link of smoking with adenomatous polyps (precursor lesions). Conversely, there is emerging evidence that fish consumption may be protective.

Occurrence:

In South Australia:

Between 1995 and 1999:

- **About 1,038 South Australians were diagnosed with colorectal cancer annually.**
- **About 432 South Australians died from these cancers annually** (colorectal cancer was exceeded as a cause of cancer death only by lung cancer).
- **Approximately 14% of all cancer deaths were due to these cancers.**

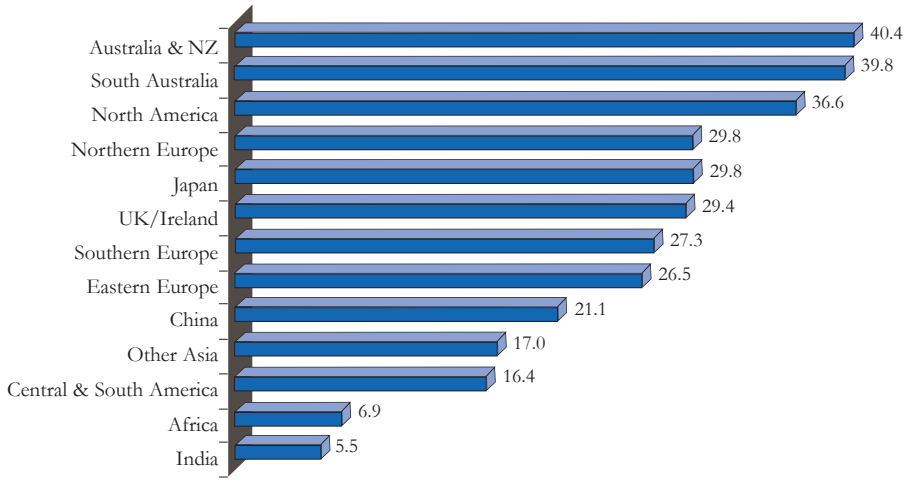
Similar numbers of males and females are affected by colorectal cancers, the male-to-female ratio approximating *1.1 to one* in South Australia. While deaths mostly occur in people aged 70 years or more, about 68 deaths occur annually in residents in their fifties or younger.

In the world:

These are the 4th most commonly diagnosed cancers in the world, and the 4th leading cause of cancer death. They account for approximately 9% of all cancers.

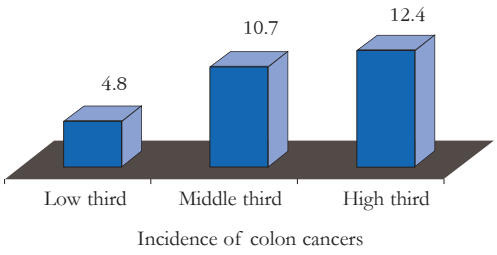
South Australia, and Australia and New Zealand more generally, have a high incidence by world standards (*Figure 17*). A similar incidence is approached only by North America. This probably is a reflection of local dietary practices, and possibly of exercise patterns. More recent data for 1994-98 confirm that the incidence of these cancers is similar in South Australia to the broader Australian experience.

Figure 17: Annual colorectal cancer incidence per 100,000, circa 1990*



*Age-sex standardized (World Population).

Figure 18: Annual incidence of rectal cancers per 100,000, by region of the World, according to the incidence of colon cancers, circa 1990*



*Age-sex standardized (World Population).

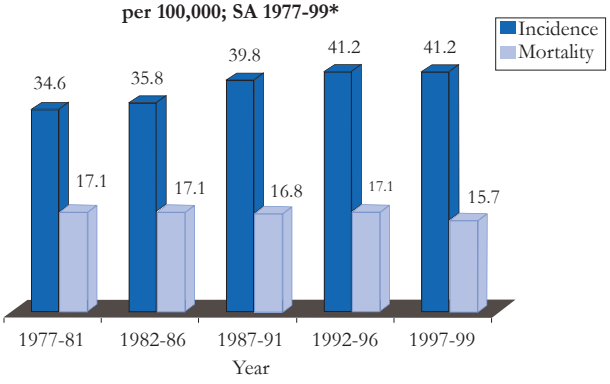
The elevated rates for Australia and New Zealand, and North America, mostly have been attributed to diets low in vegetables and high in processed meat and fat. Uncertainty exists about the contribution of individual factors and of the validity of early research findings on diet.

It is likely from the strong geographic correlation between colonic and rectal cancer incidence, as observed in the present international data (Spearman r=0.9; p<0.001), that these cancers have a similar aetiology. *Figure 18* shows that regions with a higher incidence of colon cancer generally have a higher rectal cancer incidence.

Time trends:

An **increase in age-sex standardized incidence of almost 20% occurred in South Australia between 1977-81 and 1992-99**, although there was little evidence of a continuing increase within this latter period (*Figure 19*). No increase was observed during 1977-99 in people under 50 years of age, suggesting that the increase may be losing momentum.

Figure 19: Annual colorectal cancer incidence and mortality per 100,000; SA 1977-99*



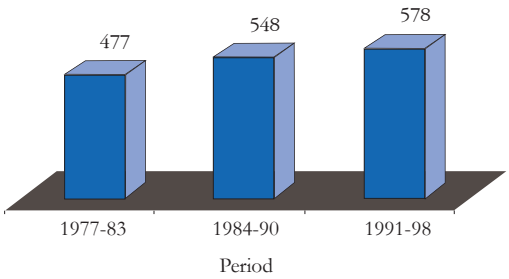
*Age-sex standardized (World Population).

Meanwhile, **mortality rates for these cancers remained relatively stable during 1977-96, with the indication of a decline in 1997-99** (F*igure 19*). A decline in mortality has been seen in other western populations and attributed to better treatment outcomes from earlier diagnosis, and in some instances, treatment advances.

Case outcomes:

The proportion of South Australians surviving colorectal cancer at five years from diagnosis increased from 47.7% for the 1977-83 diagnostic period to 54.8% for 1984-90 and 57.8% for 1991-98 (Figure 20).

Figure 20: Numbers per 1,000 cases surviving colorectal cancers five or more years from diagnosis; SA 1977-98*

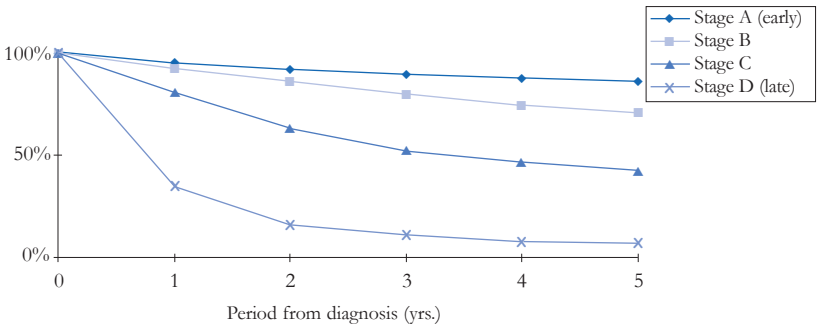


*Date of censoring: December 31st, 1998.

Similar survival gains have been observed in North America, and elsewhere in Australia, and ascribed to earlier diagnosis. Meanwhile, improved treatment outcomes have been seen for specific stages and attributed to increased surgical specialisation and advances in adjuvant therapy. *Figure 21* shows the pronounced differences in five-year case survivals that occur by stage of progression of disease at diagnosis.

Four randomised trials have shown that screening for faecal occult blood, with endoscopic follow-up, can reduce the death rate. Community groups offered this screening every two years experience about a 15-20% reduction in mortality from these cancers. The reduction presumably would be greater among those community members who elect to participate in the screening (probably about a 30% reduction). Larger reductions again may apply with more frequent screening.

Figure 21: Case survivals(%) from colorectal cancer by stage; SA teaching hospitals, 1980-98*

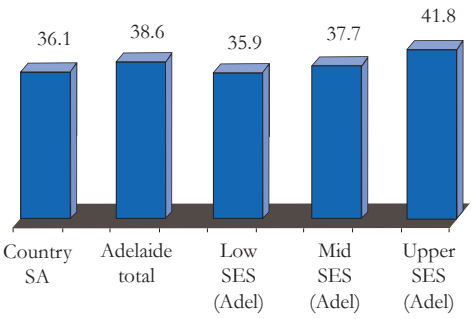


*Date of censoring: December 31st, 1998.

Other trends:

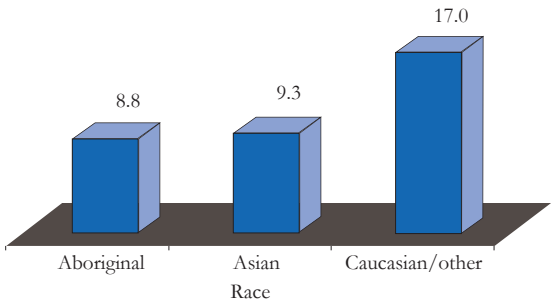
Colorectal cancer is seen in most countries to have a **high socio-economic gradient** and to be **more common in large urban centres**. A similar pattern applies to South Australia (*Figure 22*). In part, this may be artificial, reflecting variations in tumour detection from screening and diagnostic testing.

Figure 22: Annual colorectal cancer incidence per 100,000 by residential area: SA 1977-96*



*Age-sex standardized (World Population).

Figure 23: Annual colorectal cancer incidence per 100,000 by race; SA circa 1977-96*



*Age-sex standardized (World Population).

Asian-born residents have a lower incidence of these cancers than other South Australians (*Figure 23*), which is consistent with the lower risk profiles seen in their countries of origin. In general, incidence rates have been about a third higher in the Australian-born than among residents born overseas. Aboriginal residents also present a low incidence (*Figure 23*), although this may have been affected artificially by a lower cancer detection (due to a lower exposure to screening and diagnostic testing).

Cancer control:

- **Having a healthy diet** - WHO's International Agency for Research on Cancer has highlighted the opportunities that exist to prevent colorectal cancers through dietary means. Potentially, rates of these cancers could be reduced in western populations by up to 35% through the adoption of diets richer in vegetables and lower in fat and potentially, heavily cooked or processed meats, and sugar. In addition, increased intakes of fibre, starch and carotenoids could be beneficial.
- **Getting moderate levels of exercise.**
- **Avoiding excess body weight.**
- **Not drinking excess alcohol.**
- **Participating in population screening with faecal occult blood testing and endoscopic follow-up** - Plans are advanced in Australia for feasibility testing of population screening.
- **If at high risk, having endoscopic monitoring** - as applying, for example, to families affected by multiple polyposis or Hereditary Non-Polyposis Colorectal Cancer, plus individuals with histories of inflammatory bowel disease.

Liver cancers

Introduction:

The liver is the largest internal organ. Pyramidal in shape, it is located just below the right lung and diaphragm. Liver cancers often cause a lump in this location. They also can cause discomfort or pain in the upper right abdomen or around the right shoulder blade. There may be abdominal bloating and signs of jaundice.

Risk factors:

Recognized risk factors include:

- **Hepatitis B infection.**
- **Hepatitis C infection** - The increased incidence of this infection, due partly to the use of contaminated needles in the injecting of illicit drugs, would be increasing the risk of liver cancer.
- **Excess alcohol intake** (via cirrhosis).
- Contamination of grain harvests with **aflatoxins** in countries with humid storage conditions.
- Possibly a low intake of vegetables.
- Possibly exposure to nitrosamines, oral oestrogen compounds, a range of other chemical compounds, and tobacco smoking.
- In relation to bile-duct cancers in some Asian countries, infections with liver flukes.

Occurrence:

In South Australia:

Between 1995 and 1999:

- **About 40 South Australians were diagnosed with liver cancers annually (mostly hepatocellular carcinomas).**
- **About 36 South Australians died from these cancers annually.**
- **One in 86 cancer deaths was due to these cancers.**

More males than females get liver cancers, the ratio being about *2.4 to one* in South Australia. This probably is due to more common excesses of alcohol intake in males than females, and possibly a greater exposure to *hepatitis B and C* infections. While deaths mostly affect people aged 70 years or more, about 5 deaths occur annually in residents in their fifties or younger.

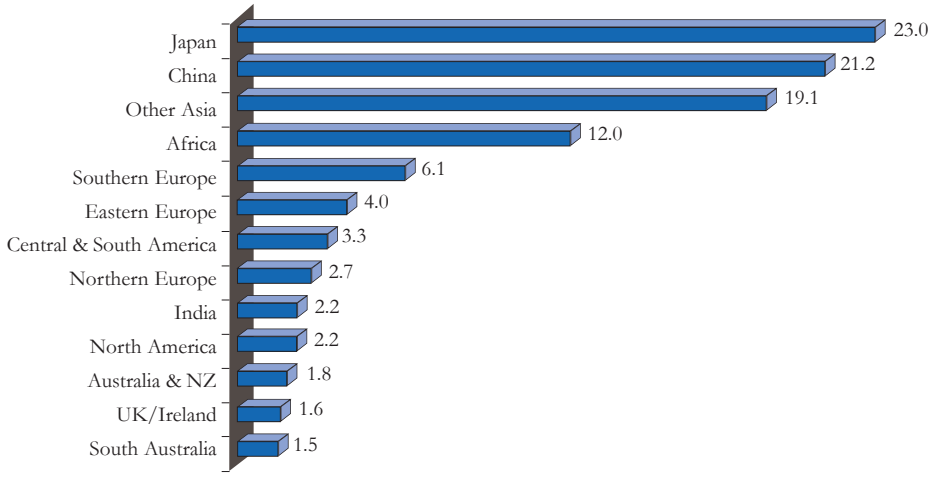
In the world:

Liver cancer is the 6th most commonly diagnosed cancer in the world, and the 3rd leading cause of cancer death. **South Australia has a very low incidence by world standards** (*Figure 24*). High incidence rates apply to Japan, China, other parts of Asia, and (less so) Africa. This is attributed to:

- Endemic infection with hepatitis (about 80% of hepatocellular carcinomas are linked to infection with the *hepatitis B* virus).
- Contamination of foodstuffs with aflatoxins (i.e., fungal-produced toxins that can contaminate peanuts, corn and other grain harvests in humid storage conditions).

More recent data for the period circa 1997 confirm that South Australia has a low incidence of liver cancers, about a third lower than for Australia as a

Figure 24: Annual liver cancer incidence per 100,000, circa 1990*



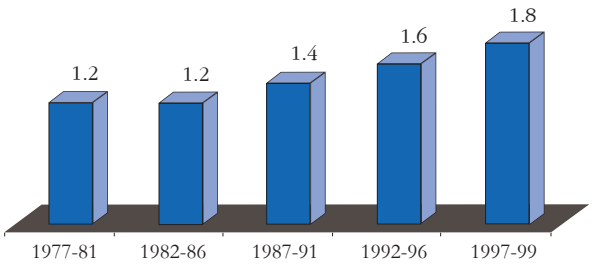
*Age-sex standardized (World Population).

whole. This would have been affected by the residential locations of Asian migrants and of people who inject illicit drugs.

Time trends:

An increase in age-sex standardized incidence of about 50% occurred in South Australia between the 1977-81 and 1997-99 (*Figure 25*), with males and females experiencing similar percentage increases. While the increased number of Asian migrants coming to South Australia during this period would have contributed, the largest percentage increase in incidence applied to residents aged 70 years or more where Asian immigration would not have been an important factor. Other factors, including trends in excess alcohol consumption, warrant investigation as a possible cause.

Figure 25: Annual liver cancer incidence per 100,000; SA 1977-99*



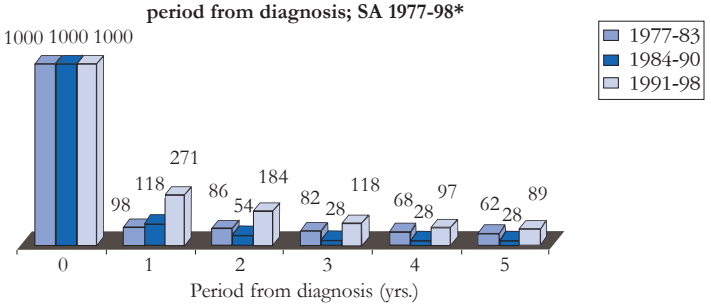
*Age-sex standardized (World Population).

Case outcomes:

Outcomes are poor for these cancers, with only about 9% of cases surviving five years or more from diagnosis. Similar figures apply elsewhere in Australia and in North America. Unfortunately, liver cancers tend to remain asymptomatic until they have spread too far for surgical resection.

While five-year survivals remain poor, there is the indication that South Australian cases are living longer now, before succumbing to their disease (*Figure 26*). Hopefully, this is not an artificial effect of moving the date of diagnosis forward (without affecting the time of death). While resection remains the mainstay of treatment with curative intent, sometimes with adjuvant radiotherapy or chemotherapy, there has been experimentation with radio-immunotherapy and other novel approaches to improve outcomes.

Figure 26: Numbers per 1,000 cases surviving liver cancers, by period from diagnosis; SA 1977-98*



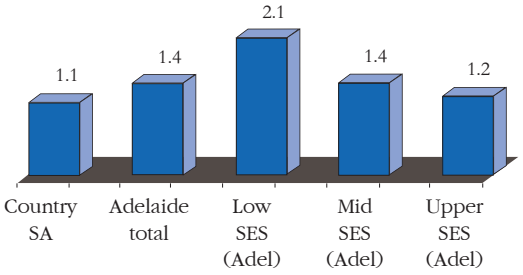
*Date of censoring: December 31st, 1998.

Other trends:

Liver cancers have a strong socio-economic gradient. In Adelaide, the incidence is about 75% higher in the lower than upper socio-economic areas. Meanwhile, the incidence is higher in Adelaide than in country regions (*Figure 27*). This may reflect places of residence of Asian migrants, plus geographic patterns of injecting-drug use.

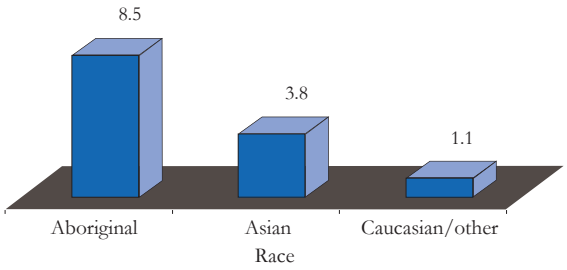
Compared with the non-Aboriginal population of South Australia, Aboriginal residents have a high incidence of this cancer. The rate also has been elevated among Asian-born residents (*Figure 28*), as would have been expected from incidence rates in their countries of origin. These elevations are likely to reflect levels of **hepatitis B** infection, and in the Aboriginal sector, alcohol consumption.

Figure 27: Annual liver cancer incidence per 100,000 by residential area; SA 1977-96*



*Age-sex standardized (World Population).

Figure 28: Annual liver cancer incidence per 100,000 by race; SA circa 1977-96*



*Age-sex standardized (World Population).

Cancer control:

- **Vaccination against hepatitis B** - Newborn infants in South Australia now have routine access to vaccination against this virus.
- **Avoiding exposure to hepatitis C** - eg, by not using needles contaminated by other people's blood (as has been common among injecting-drug users).
- **Not drinking excess alcohol**. It has been estimated that avoiding excess alcohol consumption could reduce the incidence of hepatocellular carcinoma in Western populations by around 15%.
- **Ensuring at a community level that blood-transfusion products are not contaminated by hepatitis B or C viruses.**
- **Storage of grain products in non-humid conditions**, so as to avoid contamination with aflatoxins.

Gallbladder cancers

Introduction:

The gallbladder is a pear-shaped organ located under the liver. It stores bile produced by the liver for the digestion of fat. Gallbladder cancers frequently are diagnosed late due to a lack of specific symptoms. Affected people may experience pain above the stomach, weight loss, fever or jaundice.

Risk factors:

- Obesity and a history of cholesterol gallstones.
- Possibly chronic infection and inflammation, ulcerative colitis, a history of multiple pregnancies, and in some Asian countries, in relation to bile-duct cancers, liver-fluke infections.

Occurrence:

In South Australia:

Between 1995 and 1999:

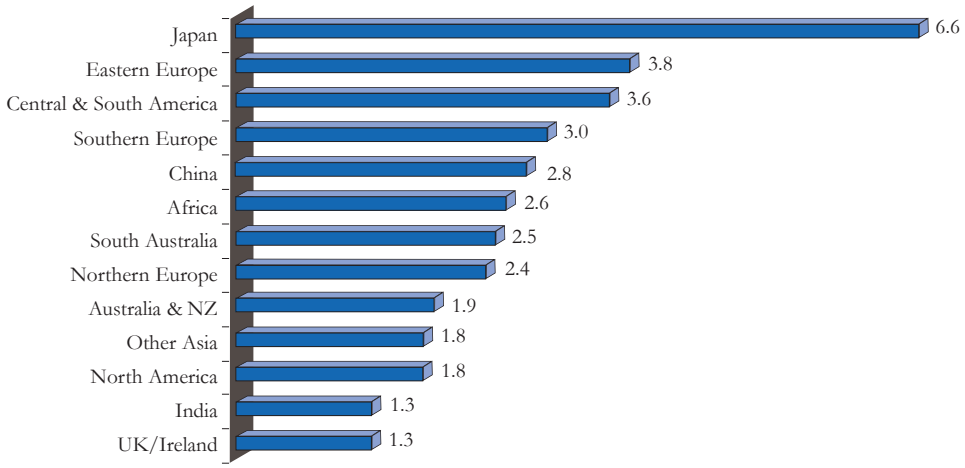
- **About 66 South Australians were diagnosed with gallbladder cancers annually.**
- **About 52 South Australians died from these cancers annually.**
- **One in 59 cancer deaths was due to these cancers.**

Unlike most cancers that affect both sexes, more females than males get gallbladder cancers. The female-to-male ratio is *1.5 to one* in South Australia. This is a reflection of hormonal factors that increase the prevalence of gallstones in females, plus effects of multiple pregnancies. While most deaths occur in people aged 70 years or more, about 5 deaths occur annually in residents in their fifties or younger.

In the world:

South Australia is middle-ranking in its incidence of these cancers by world standards (*Figure 29*). High incidence rates apply to Japan and (less so) Eastern Europe, and Central and South America. The geographic distribution of these cancers correlates strongly with that of cholesterol gallstones. Data for 1993-97 confirm that South Australia has a slightly higher incidence than Australia as a whole.

Figure 29: Annual incidence of cancers of the gallbladder per 100,000, circa 1990*

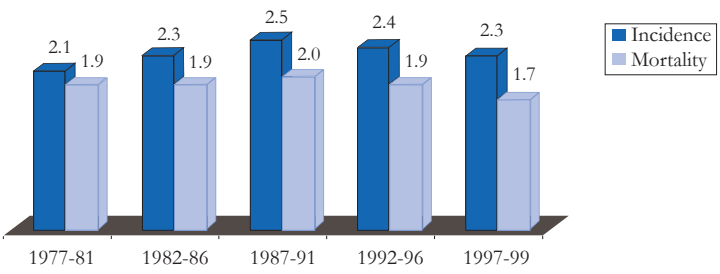


*Age-sex standardized (World Population).

Time trends:

Neither incidence nor mortality rates have decreased in South Australia (*Figure 30*), although a downward trend has been observed in the USA

Figure 30: Annual incidence and mortality rates for cancers of the gallbladder per 100,000; SA 1977-99*



*Age-sex standardized (World Population).

and in some other *western* populations, and attributed to more frequent cholecystectomies for gallbladder disease.

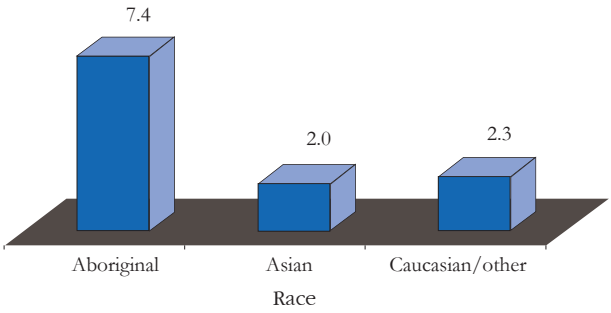
Case outcomes:

These cancers usually are diagnosed late, with very poor outcomes. The proportion of cases surviving five years or more from diagnosis in South Australia was 10.7% for the 1977-83 diagnostic period, 17.0% for 1984-90, and 14.2% for 1991-98. Similar survivals have been reported for other parts of Australia. During 1992-97, the corresponding survival figure for USA cases was 16%. Research is being directed at improving outcomes through the use of new chemotherapies, plus radio-sensitising drugs.

Other trends:

The incidence of these cancers does not vary in South Australia by socio-economic status or place of residence. Asian residents have an incidence equivalent to, or a little lower than that of other South Australians. Meanwhile, the risk has been elevated among Aboriginal residents, which corresponds with their elevated risk of gallstones (*Figure 31*).

Figure 31: Annual incidence of cancers of the gallbladder per 100,000 by race; SA circa 1977-96*



*Age-sex standardized of (World Population).

Cancer control:

- **Avoiding obesity.**

Cholesterol gallstones and other gallbladder disease sometimes recur with sufficient frequency to justify a cholecystectomy. This eliminates any further risk of gallbladder cancer.

Pancreatic cancers

Introduction:

The pancreas, sometimes referred to as a "hidden organ", is located behind the stomach. Generally, pancreatic cancers become symptomatic at a relatively late stage. Symptoms can include jaundice, abdominal or back pain, weight loss and digestive problems.

Risk factors:

- **Tobacco smoking** - Accounts for about 22% of cases in populations with a predominantly western culture like South Australia.
- **Diabetes mellitus.**
- Probably diets **deficient in fruit and vegetables**.
- Possibly diets low in vitamin C and fibre, and high in animal protein and cholesterol.

Occurrence:

In South Australia:

Between 1995 and 1999:

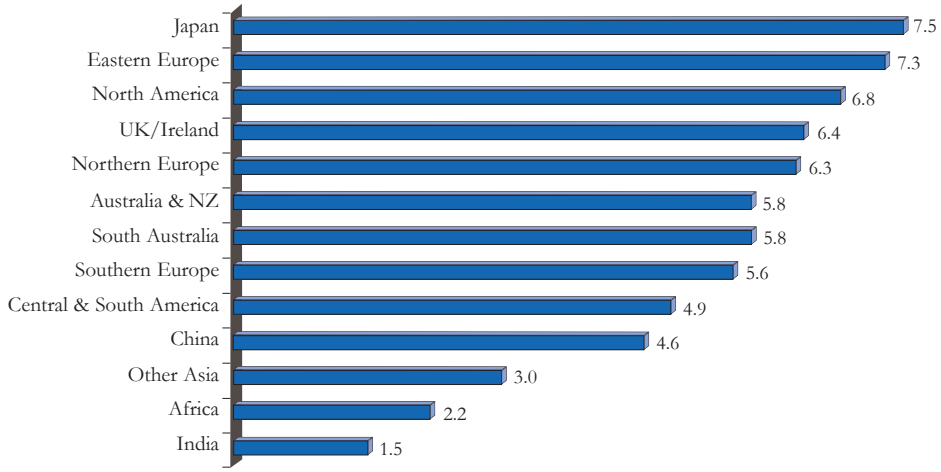
- **About 148 South Australians were diagnosed with these cancers annually.**
- **About 138 South Australians died from these cancers annually.**
- **Just over 4% of all cancer deaths were due to these cancers.**

Slightly more males than females get pancreatic cancers, the ratio being about *1.1 to one* in South Australia. Deaths are concentrated in older people, although approximately 19 deaths occur annually in residents in their fifties or younger.

In the world:

Cancers of the pancreas are relatively uncommon, accounting for around 2% of newly diagnosed cancers. South Australia has a middle-ranking incidence by world standards (*Figure 32*). High incidence rates apply to Japan, Eastern Europe, and North America. South Australia has an equivalent rate to that of Australia and New Zealand more generally, as confirmed by data for 1993-97.

Figure 32: Annual pancreatic cancer incidence per 100,000, circa 1990*

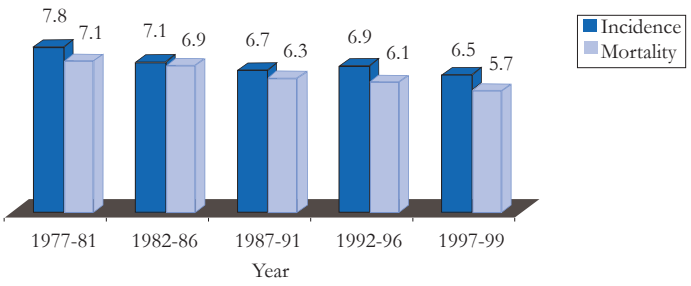


*Age-sex standardized (World Population).

Time trends:

A downward trend in age-standardized incidence and mortality has been evident in South Australian males (*Figure 33*), but not in females. A similar pattern in North America and Europe has been attributed to trends in tobacco smoking.

Figure 33: Annual pancreatic cancer incidence and mortality rates per 100,000 males; SA 1977-99*



*Age standardized (World Population).

Case outcomes:

Outcomes are very poor. In South Australia, only about 3% of cases survive five years or more from diagnosis. This is typical of outcomes in other countries. USA data indicate that, even when the disease appears to be localised at diagnosis, the five-year survival is still low (about 16%).

Other trends:

Asian-born residents of South Australia have a lower incidence of this cancer than other residents. There has been a tendency for higher rates in suburban Adelaide than in country areas, and particularly in the lower socio-economic suburbs. While this evidence is not clear-cut, it accords with international sociodemographic data. Aboriginal residents also tend to have elevated rates. These trends may reflect differences in tobacco smoking and dietary practices.

Cancer control:

The only realistic approach in the immediate future is primary prevention by:

- **Not smoking.**
- **Having a diet rich in fruit and vegetables.**

Control measures for cancers of digestive organs

Based on the risk factors and cancer-control measures cited in this publication, it is estimated that at least 40% of cancers of the digestive organs, and of the deaths they cause, could be prevented. Furthermore, over half this gain could be achieved through dietary means.

The following practices are recommended:

- **Eating more vegetables and fruit.**
- **Not smoking.**
- **Not drinking excess alcohol.**
- **Having moderate levels of exercise.**
- **Immunising children and high-risk groups against hepatitis B.**
- **Practising infection-control measures, including avoidance of exposure to hepatitis C infection.**
- **Proper use of refrigeration for perishable foods and maintenance of high levels of food hygiene.**
- **Participation in recommended screening practices and associated early-detection initiatives.**

Treatment advances should be pursued through innovative research, with incorporation of evidence-based treatment protocols into routine service delivery. Broader support services, such as help-line advice, peer support, and respite care should be available to assist people living with cancer. Palliative-care services also are required to help with pain control and to give support to those with terminal conditions.

Appendix A

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Glossary of terms

Adenocarcinoma:
The prefix *adeno* refers to glands. Cancers of this type frequently originate from normal gland-forming cells (as found, for example, in sweat glands and salivary glands).

Adenomatous polyps:
Polyps are growths of cells that protrude "like mushrooms" from the linings of body organs. Adenomatous polyps have glandular features. They often originate from gland-forming cells.

Adjuvant therapy:
"Adjuvant" means *assisting* or *aiding*. A patient may, for example, have surgery or radiotherapy as the main treatment. In addition, there may be drug treatment for any remaining microscopic disease. In this instance, the drug treatment would be regarded as *adjuvant therapy*.

Aetiology:
The scientific study of causes of disease (eg, cancer).

Aflatoxins:
These are toxic substances produced by a fungus found on legumes and grains stored in warm, humid conditions. They have strong cancer-causing properties and have been linked specifically to liver cancer.

Age-standardized:
A statistical adjustment to make the age distributions of different populations statistically equivalent. This enables comparisons of cancer rates between populations with different age distributions. The results show the differences in cancer rates that would have applied, had the age distributions of the populations been the same.

Allium vegetables:
These include a range of bulbs such as onions, garlic, and chives.

Anti-oxidant:
A substance that reduces the effect of oxidants (i.e., compounds that cause genetic and other material to combine with oxygen). Oxidants are the waste products of various chemical reactions in cells. They are commonly involved in cancer development.

Barrett's oesophagus:
A disorder of the lining of the oesophagus caused by chronic irritation and inflammation from reflux oesophagitis (see later in this glossary). Usually, the lower third of the oesophagus is affected.

Cancer (eg, carcinoma):
An uncontrolled growth of cells invading the surrounding areas of the body, which have the ability to spread to distant sites through the blood stream or lymphatics.

Cardia:
The section of the stomach closest to the oesophagus.

Carotinoids:
A group of red, orange or yellow pigmented compounds found in certain foods, such as carrots, sweet potatoes and green-leafed vegetables.

Chemotherapy:
Cancer treatment by chemical agents or drugs.

Cholecystectomy:
Surgical removal of the gallbladder.

Chronic mucosal irritation:
Prolonged irritation of mucous membranes (i.e., membranes that line the surfaces of body organs) through physical, chemical or other means.

Cirrhosis of the liver:
Liver cirrhosis is an inflammatory condition where necrotic nodules form (i.e., nodules of dead cells) and liver function is often reduced. It can be a long-term effect of chronic liver disease.

Crohn's disease:
A chronic inflammatory disease, generally of the lower part of the small intestine, although the large bowel (colon/rectum) also can be affected.

Diabetes mellitis:
A disease caused by reduced insulin secretion or a reduced effect of secreted insulin on sugar, starch, and fat chemistry in cells.

Duodenum, jejunum & ileum:
The three parts of the small intestine.

Dysplastic cells:
Cells with an abnormal structure. They are not cancerous, although they can be a step in the development of cancer.

Endogenous nitrosation:
The production of nitrosamines (see later in this glossary) and related compounds within the body.

Environmental tobacco smoke:
Tobacco smoke in the environment (this can pose a health risk if inhaled by non-smokers).

Epidemic:
A substantial increase in a short space of time of numbers of people with a disease.

Familial adenomatous polyposis (Gardner's syndrome):
A hereditary disease where large numbers of polyps develop in the large bowel that are liable to progress to cancer. Often there is also an increased risk of tumours in other sites, such as the bones and connective tissue.

Familial cancers:
Cancers occurring in families (i.e., family members are at an increased risk).

First-degree relatives:
Immediate family members (i.e., parents, children, brothers and sisters).

Five-year cancer survival:
The % of patients surviving their cancer five years from diagnosis.

Gastrectomy:
Partial or total excision of the stomach.

Gastroscopy:
Inspection of the interior of the stomach with a gastroscope. This is a flexible tube with lights and mirrors, which is passed through the mouth to the stomach, in order to make a visual inspection.

Helicobacter pylori:
Bacteria that cause inflammation and ulcers of the stomach.

Hepatocellular carcinoma:
The most common cancer arising in the liver.

Heriditary cancers:
Cancers arising from inherited genes.

Hyperacidity (gastric):
An elevated acidity of stomach juices.

Immunotherapy (cancer)):
Treatment aimed at increasing immunity to a cancer.

Incidence rate (cancer):
The rate at which cancers arise in the population. It may be expressed as the number of new cases diagnosed annually per 100,000 people.

Jaundice:
A yellowing of the skin and eyes as a result of liver, gallbladder or pancreatic disease (eg, cancer).

Lesion:
An area of damage or injury to an organ. It may be described as a wound, ulcer, sore or a cancer.

Liver-fluke infections:
Infection by a fluke (worm) that penetrates the skin and invades the liver, causing inflammation. This type of fluke, seldom seen in Australia, is common in some Asian environments.

Malignant disease:
Cancerous. Has the ability to invade locally or spread to a distant part of the body.

Metaplastic cells:
Cells of an organ transformed to another type not

usually found at that organ site.

Metastatic cancer:
A cancer that has spread from its place of origin to other more distant parts of the body. Cancer deposits in these more distant locations are called metastases.

Micronutrients:
Elements in the diet that are essential in small quantities for growth and development (eg, vitamins).

Mortality rate (cancer):
The rate at which deaths from cancer occur in the population. It may be expressed as the number of deaths annually per 100,000 people.

Nitrosamines:
A group of chemical compounds with strong cancer-causing properties.

Occult blood:
Blood present at microscopic levels. For example, the faecal occult blood test is designed to detect microscopic traces of blood in faeces (i.e., occult blood).

Oral oestrogen:
The intake of oestrogen (female sex hormone) through the mouth.

Palliative care:
Treatment directed at the control of symptoms, such as pain, and at increasing the quality of life in people with a life-threatening illness.

Pathogenesis:
The events and reactions that occur in the body as part of the development of disease.

Peutz-Jeghers syndrome:
Gastrointestinal polyposis, especially in the small intestine, generally accompanied by pigmentation of areas of the skin and mucous membranes. This can be an inherited trait.

Positive correlation:
Two features are positively correlated if they tend to vary in unison (eg, height and weight).

Prevalence (cancer):
The number of people with a recent cancer diagnosis (eg, in the past five years) per 100,000 people.

Primary prevention:
Preventing a disease from occurring.

Prognosis:
Estimation in advance of the likely course of a disease (eg, as may be indicated by the extent of the disease at diagnosis).

Radiological:
The use of X-rays, radioactive substances, and other forms of radiant energy for diagnosis and treatment.

Radiosensitive:
Sensitive to the effects of radiotherapy.

Radiotherapy:
Treatment by radiation (eg, by X-rays or gamma rays).

Reflux oesophagitis:
Inflammation and other damage to the lining of the oesophagus (usually the lower third) caused by the reflux of stomach acids into the oesophagus.

Resectable cancer:
A cancer that can be removed surgically.

Socio-economic gradient of cancer:
Where cancer risk varies according to people's social or economic status.

Squamous cell carcinoma:
A cancer composed of squamous cells.

Therapy (cancer):
Cancer treatment. This may comprise surgery, chemotherapy, radiotherapy, hormone therapy, immunotherapy, other treatments, or treatment combinations.

Ulcerative colitis:
Chronic inflammation of the colon, with ulcers.