Osteoporosis in South Australia
Prevalence, effects & impact

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Executive Summary

Osteoporosis is a debilitating, painful and costly condition characterised by a thinning of bones that makes them weak and brittle. Risk factors for osteoporosis that result in low bone density, include advancing age, lack of weight bearing exercise, low calcium intake and menopause. The main sequelae of osteoporosis are fractures and associated pain, disability and loss of functioning.

Main Findings

This report highlights the epidemiological evidence gained in South Australia on the impact of osteoporosis. The main findings of this report are as follows:

• Population-based surveys conducted in South Australia have shown that the self-reported prevalence of osteoporosis diagnosed by a doctor is around 4%. However this condition is underestimated in self-reported studies, as many people with osteoporosis (up to 80% of 80 year old women) do not know that they have it. Current studies also indicate that men are about 10 years behind women in terms of the development of osteoporosis.

• Osteoporosis has a profound effect on quality of life. Those with osteoporosis demonstrate lower scores than the general population in all eight dimensions of the Short Form 36 (SF-36), particularly with regard to physical functioning, general health, bodily pain and vitality.

• Fractures are the most significant outcome of osteoporosis. They result in pain, deformity and disability, and increase dependence on health services, nursing homes and other support services. Between 1999 and 2001 a total of 2347 people were hospitalised in South Australia, as a result of fractures attributed to osteoporosis, and over 80% of these people were aged over 70 years. Hip fractures resulted in an average length of stay in hospital of between 10 and 12 days.

• South Australians’ perception of their risk of osteoporosis is low, with about three quarters of the population believing themselves to be at low or moderate risk. Women are more likely to think they have a higher risk, as are people less than 50 years. Older people are more likely to not know what their risk is. Men perceive their risk to be particularly low, despite the fact that death rates in males from accidental falls are equivalent to females.
• About half the population know what osteoporosis is, and most can identify lack of calcium in the diet as a cause of osteoporosis. However this knowledge is related to education and people with lower educational attainment are less likely to know about osteoporosis.

**Policy recommendations**

Osteoporosis is an insidious disease, in which progress is gradual and without warning signs. Many people experiencing osteoporosis have not been diagnosed and it is only when they experience an osteoporotic fracture, or their bone mass is tested on the basis of perceived high risk, that a correct diagnosis is made.

The impact of osteoporosis is likely to increase in South Australia as the population ages and more people become at risk. Moreover, life expectancy is increasing and people will be living with chronic conditions such as osteoporosis for longer periods of time.

Along the continuum of bone mass deterioration, there are a number of points of intervention:

• prevent the development of osteoporosis;
• identify and effectively treat people with osteoporosis;
• prevent people from falling;
• treat and care for people experiencing fractures.

Steps can be taken to approach the policy issues at these intervention stages:

• While the thinning of the bones is somewhat inevitable as we age, healthy bone mass can be encouraged from an early age through exercise and nutrition. It is estimated that bone mass accumulated during youth is equally responsible for bone density at age 70 years as the rate at which bone is lost over time. Policies to encourage weight-bearing exercise and calcium rich diets in children and teenagers are required, and are being addressed by national campaigns. However exercise and nutrition programs are not only useful in young people. Calcium has a preventive effect on bone loss and thus is useful in all diets. Vitamin D plays a vital role in the body’s ability to utilise calcium and thus is also important. Exercise too has a positive impact on bone mass and the other benefits of exercise such as improved muscle tone and balance make it important in fracture prevention programs.
• Women experiencing menopause, a time when bone density rapidly decreases, have the option of taking hormone replacement therapy (HRT) to decrease the bone loss. While HRT is not suitable for every woman, the options for HRT use should be explored and women should be educated about its use and role in osteoporosis prophylaxis.

• Drugs are increasingly available to increase bone density and decrease resorption. Educating general practitioners, who are the first line health professionals for the majority of the population, is an important step in enabling them to recognise, diagnose and treat osteoporosis.

• Screening measures are available (e.g. ultrasound, dual energy X-ray absorptiometry). Policies regarding use of this equipment needs to determined in terms of cost, age groups, gender and risk factor identification.

• Falls can be prevented through community programs that help people make their home environments safer by removing dangerous obstacles and installing grip rails or non-slip flooring in shower areas. Exercise programs that improve muscle tone and balance may also be useful.

**Overview of report**

This report summarises the findings from surveys conducted by the Centre for Population Studies in Epidemiology, Department of Human Services SA on behalf of Osteoporosis SA. The prevalence of osteoporosis in South Australia over a six year period from 1995 to 2001 is determined and issues such as risk factors associated with osteoporosis, the impact of osteoporosis in terms of fracture rates, quality of life, beliefs and knowledge of South Australians about osteoporosis are also highlighted.
1 Introduction

The strength of bone tissue is known as bone density and, during ageing, bone density begins to decline due to bone resorption. The amount of bone present later in life is determined by the bone mass accrued during youth and the rate of bone loss\(^1,2,3,4\). When bone density reaches a defined point it is known as osteoporosis, which means that bones are weak, brittle and easy to break. The continuum of bone density progresses from growth and development of bone mass, maintenance of bone mass, through to loss of bone density (osteoporosis) to subsequent fracture. Along this continuum interventions can address prevention, treatment and care for people with osteoporosis.

Osteoporosis is more common in older people, making it a key health issue for Australia’s ageing society. The impact of osteoporosis is substantial, especially to the individual who experiences fracture. It has a marked impact on quality of life and general functioning. Health costs associated with fracture are extensive and range from acute primary care to long-term nursing home care for those unable to care for themselves after a fracture.

Osteoporosis is more prevalent in people over 60 years of age and amongst women, and mortality for osteoporosis-related fractures is greater for females than for breast and ovarian cancer combined\(^5\). Risk factors for osteoporosis include age, sex, family history, race and lifestyle (nutrition and exercise).

The majority in the general population feel they are at low risk for getting osteoporosis, and this is especially true among older people - those who are most at risk. Changing perceptions of risk for the condition is a major hurdle in osteoporosis education, prevention and treatment, as well as for reducing the risk of falls and fracture.
2 Method

The majority of data in this report were obtained from the Health Omnibus Surveys conducted in South Australia between 1995 and 2001. Data relating to fracture incidence was obtained from the Integrated South Australian Activity Collection (ISAAC).

The South Australian Health Omnibus Survey (HOS) is a clustered, self-weighting, systematic, multi-stage survey of metropolitan Adelaide and country towns with populations over 1000\(^6\). Trained interviewers conduct face-to-face interviews with the person aged 15 years and over in each household who was next to have a birthday. Hotels, hospitals and nursing homes are not included in the sample, and there is no replacement for non-respondents. Data are weighted by age, gender, and geographical location to Australian Bureau of Statistics census data so that the sample accurately reflects the South Australian population.

Response rates for the surveys are detailed in Table 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number interviewed</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>3016</td>
<td>74.2</td>
</tr>
<tr>
<td>1997</td>
<td>3019</td>
<td>70.8</td>
</tr>
<tr>
<td>1998 (Autumn)</td>
<td>3010</td>
<td>70.2</td>
</tr>
<tr>
<td>1998 (Spring)</td>
<td>3001</td>
<td>69.7</td>
</tr>
<tr>
<td>1999</td>
<td>3013</td>
<td>70.6</td>
</tr>
<tr>
<td>2001</td>
<td>3037</td>
<td>71.3</td>
</tr>
</tbody>
</table>

In questions about osteoporosis, respondents are asked whether or not a doctor has told them that they have osteoporosis. All data from HOS regarding osteoporosis prevalence reported in this document refers to self-report, doctor-diagnosed osteoporosis. This prevalence is likely to be substantially less than the measured prevalence of osteoporosis in the population, which could only be ascertained through bone density testing.
3 Prevalence of osteoporosis

The prevalence of osteoporosis is difficult to determine, predominantly because many people experiencing osteoporosis have not been diagnosed. It is only when they experience an osteoporotic fracture, or their bone mass is tested on the basis of perceived high risk, that a correct diagnosis is made. Self report has been shown to significantly underestimate the prevalence of osteoporosis. Evidence of this is provided by an American study conducted between 1988 and 1994, of post-menopausal women who had never taken exogenous hormones, found that self-reported prevalence was around 5%, while bone densitometry revealed 17% actually had osteoporosis.

Estimates of osteoporosis also vary greatly according to the population tested and whether dual energy X-ray absorptiometry, ultrasound or other means are used to test bone density and which area of the body is tested. Examples of the variations in prevalence are provided below:

- A Japanese study found the prevalence of osteoporosis in women 50-79 years to be 56.8% when measured at the distal radius, 38% at the spine and 11.6% at the femoral neck.
- A Taiwanese study using ultrasound of the heel found an overall prevalence of 12% in a population aged from 21 years.
- A study of Thai women aged 40-80 years found a prevalence of osteoporosis of more than 50% in women over 70 years.
- A large Canadian study found a prevalence of osteoporosis of 15.8% in women over 50 years measured at the lumbar spine or femoral neck.
- In Australia, the Geelong Osteoporosis Study found the prevalence to rise with age to 87% for women over 79 years.
- Australian data from the Dubbo Osteoporosis Epidemiology Study suggests 56% of women and 29% of men over the age of 60 years will sustain an osteoporotic fracture in their lifetime.

3.1 Prevalence in South Australia

Respondents to the HOS were asked if they had ever been told by a doctor that they had osteoporosis. Between 2.9% and 4.8% of the population reported osteoporosis in the years between 1995 and 2001. When data from all years is combined, the prevalence of diagnosed osteoporosis is 3.7% (95% CI: 3.4–4.0). Table 2 shows the prevalence recorded in each year.
### Table 2: Prevalence of diagnosed osteoporosis by year of survey

<table>
<thead>
<tr>
<th>Year</th>
<th>Prevalence (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>3.2 (2.6-3.9)</td>
</tr>
<tr>
<td>1997</td>
<td>3.8 (3.1-4.5)</td>
</tr>
<tr>
<td>1998 Autumn</td>
<td>3.2 (2.6-3.9)</td>
</tr>
<tr>
<td>1998 Spring</td>
<td>2.9 (2.4-3.6)</td>
</tr>
<tr>
<td>1999</td>
<td>4.2 (3.5-5.0)</td>
</tr>
<tr>
<td>2001</td>
<td>4.8 (4.1-5.6)</td>
</tr>
</tbody>
</table>

### 3.2 Trends in prevalence 1995-2001

The general upwards trend in prevalence of diagnosed osteoporosis between 1995 and 2001 (Figure 1) was significant (p<0.05) on a χ² test for trend.

**Figure 1: Trend in self reported prevalence of osteoporosis in SA 1995 - 2001**
Other issues highlighted were:

- Prevalence in 2001 was significantly higher than in 1995 and 1998 ($p<0.05$), tending towards significance when compared to 1997 ($p=0.06$) and not significantly different from the 1999 prevalence.
- Increasing prevalence estimates may reflect a real increase in the disease, or better diagnostic tests and measures, more awareness in the community leading to increased diagnoses, or a combination of these factors.
- Significantly more females reported being told they had osteoporosis in 1997, 1999 and 2001 than in 1995 (Figure 2).
- Significantly more females reported being told they had osteoporosis in 2001 than both surveys in 1998 (Figure 2).
- The prevalence of males with osteoporosis was significantly less in 1998 compared to 1995, 1999 and 2001 (Figure 2).

**Figure 2: Overall prevalence of self reported osteoporosis in males and females, 1995 - 2001**
3.3 Prevalence by gender

- Women are far more likely than men to have been diagnosed with osteoporosis.
- In 2001, females were four times more likely to have been told that they have osteoporosis (7.6% vs 1.9%, RR 4.02, 95% CI: 2.68-6.03) than men.
- This pattern has been similar for all the years of the survey, with women between 3 and 10 times more likely to have osteoporosis than men.

3.4 Prevalence by age

- Osteoporosis is predominantly a disease of old age, and the age distribution of respondents reporting osteoporosis reflects this.
- There is a clear relationship between age and prevalence of diagnosed osteoporosis, as can be seen in Figure 3, which shows the results for 2001.
- This relationship has been apparent in all years of the survey.

**Figure 3: Prevalence of diagnosed osteoporosis by age group and gender, 2001**
3.5 Prevalence by area of residence

- The prevalence of diagnosed osteoporosis was not associated with area of residence in South Australia in any of the surveys.
- It is important to note however that the actual number of cases is greater in the metropolitan area, due to the greater population there.
- This is also likely to be affected by the general demographic trend of older people moving into metropolitan areas as they age, to be closer to services.

3.6 Prevalence by education, employment and income levels

- In general, there is an inverse relationship between the level of education obtained and the prevalence of diagnosed osteoporosis, higher rates of osteoporosis were found in groups with lower education levels.
- There was a relationship between income and diagnosed osteoporosis with those in lower income groups having a higher rate of osteoporosis.
- There was no relationship between employment status and diagnosed osteoporosis.
- People with diagnosed osteoporosis tended to be widowed.
- All of these relationships could be confounded by age and/or gender. Older people on pensions fall into lower income groups, older people may have had less education and been required to leave school at younger ages, older people tend not to be employed and older women tend to be widowed.

3.7 Implications

The burden of osteoporosis is clearly held with the elderly and more so with elderly women. The aging of the population means that the number of people with osteoporosis is going to increase, with concomitant increases in fractures and impact on individuals, families and the health system.
4 Risk factors for osteoporosis

Some of the recognised risk factors for osteoporosis include age, gender, early menopause, changes in hormonal levels, high caffeine intake, smoking, alcohol abuse, drug use, family history, race, calcium and other mineral intake, body size and exercise\textsuperscript{15,16,17}. Whilst some of these are not amenable to intervention, recognising and understanding risk factors is useful in enabling more precise targeting of prevention and intervention strategies at those most at risk.

In the Health Omnibus Surveys, respondents are asked a range of questions about risk factors for ill-health including smoking, exercise, alcohol intake and body mass index. Questions vary from year to year depending on the users of the survey, and some of these risk factors have been investigated in relation to their association with the prevalence of osteoporosis. One of the important risk factors for osteoporosis, nutrition, has not been addressed in these surveys due to the difficulty of accurately assessing nutrient intake using survey methodology. Calcium and Vitamin D have both been recognised as important in the development and maintenance of healthy bone density\textsuperscript{16,18}.

4.1 Family history

In 1995 respondents were asked if they had parents or siblings who had broken a bone when they were over 50 years of age.

- People under 50 years of age, whether male or female, were four times as likely to have been told that they have osteoporosis if they had parents or siblings who had broken a bone than those who had not (RR 4.16, 95% CI: 1.43-12.04).
- There was no association between osteoporosis and having a parent or sibling who had broken a bone amongst those aged 50 years and over (RR 1.18, 95% CI: 0.71-1.94).
4.2 Smoking

Questions about smoking were asked in 1995, 1997, 1998 and 1999.

• There was no association between current smoking and the prevalence of osteoporosis, regardless of age.

4.3 Body mass index

Body mass index (BMI) was investigated in 1995, 1997 and 1998 with respondents self reporting their height and weight. BMI was then calculated by dividing weight in kilograms by the square of height in metres.

• There was no association between BMI and osteoporosis regardless of age.

4.4 Exercise

In 1995 and 1997 respondents were asked about their exercise habits. Respondents were considered to have done exercise if they had walked, or done moderate or vigorous exercise in the two weeks prior to the survey.

• There was no association between exercise and the prevalence of osteoporosis, regardless of age.

4.5 Other chronic conditions

In Health Omnibus Surveys respondents have been asked questions about diagnoses of other chronic conditions. These questions vary depending on the users of the survey but conditions covered have included diabetes, asthma, hearing loss and arthritis.

• There was an association between asthma and osteoporosis in the 1997, 1999 and 2001 surveys for people over 50 years, with people with asthma statistically significantly more likely to also have osteoporosis. The same trend was apparent although not statistically significant in the 1995 and 1998 surveys. There was no association in any year between asthma and osteoporosis for people less than 50 years. However respondents with asthma may also take steroids to alleviate asthma symptoms. A complication of prolonged steroid use is thinning of bones.
• A 1998 question about chronic bronchitis did not reveal any association with osteoporosis.
• There was no association between diabetes and osteoporosis in any of the surveys, however in 2001 there was a tendency towards those with diabetes to be significantly more likely to have osteoporosis (p=0.05).

There was a statistically significant association between osteoporosis and arthritis in the three surveys where both questions were asked (1998, 1999 and 2001).

• In 2001, males were nearly three and a half times more likely to have osteoporosis if they had also been told that they had arthritis (RR 3.31, 95% CI: 2.37–4.63) while women were over two and a half times more likely (RR 2.67, 95% CI 2.33–3.07). The prevalence of both was 6.6% in males and 19.6% in females.
• In 1999 men were almost four times more likely to have osteoporosis if they had also been told they had arthritis (RR 3.93, 95% CI 1.77-8.74) while women were almost five times more likely to have osteoporosis if they had also been told they had arthritis (RR 4.63, 95% CI: 3.37-6.35). Over five percent (5.1%) of males and 15.9% of females had been told they have both osteoporosis and arthritis.
• In the 1998 Autumn survey, men were over six and a half times more likely to have osteoporosis if they had also been told they had arthritis (RR 6.66, 95% CI: 2.66-16.69) while women were five and a half times more likely to have osteoporosis if they had also been told they had arthritis (RR: 5.63, 95% CI: 4.18-7.58). Over three percent of males (3.3%) and 25.1% of females had been told they have both osteoporosis and arthritis.
• In the 1998 Spring survey, men were over five times more likely to have osteoporosis if they had also been told they had arthritis (RR 5.24, 95% CI: 1.95-14.08) while women were nearly four times more likely to have osteoporosis if they had also been told they had arthritis (RR 3.75, 95% CI: 2.58-5.44). The prevalence of both was 4.2% in males and 16.7% in females.
• However, steroids have been used in the treatment of arthritis and prolonged use may lead to the thinning of bones and an increased prevalence of osteoporosis.

4.6 Hormone replacement therapy

In 1995, 1997 and 1998 (Autumn), females over 40 years were asked about their history of taking hormone replacement therapy (HRT) to treat the symptoms of menopause.

• Women who were currently taking or who had ever taken HRT were more likely to have also been told they have osteoporosis.
This association was stronger for women under the age of 50 years, who were between six and nine times more likely to have been diagnosed with osteoporosis if they had taken or were currently using HRT.

The association was also statistically significant although weaker for women over 50 years.

The survey was unable to determine the temporal relationship between a diagnosis of osteoporosis and the use of HRT.

Information regarding use of HRT has been collected in HOS since 1991. The prevalence of use of HRT for women aged 40 years and over is summarised in Figure 4.

**Figure 4: Prevalence of women 40 years and over taking HRT since 1991**

![Prevalence of hormone replacement therapy use (%)](image_url)
4.7 Hormone replacement therapy as prophylaxis or treatment for osteoporosis

HRT has been advocated for both protection against and treatment for osteoporosis. Menopause, especially early menopause, causes an acceleration of calcium loss from the bone, resulting in a greater risk of osteoporosis. In the 1994, the survey investigated the knowledge among female respondents 40 years of age and over regarding HRT and its association with preventing and treating osteoporosis:

- Respondents (n=814) who were aged 40 years and over answered questions about HRT; 20% were taking HRT.
- Nearly 10% said women at risk of osteoporosis (weak or fragile bones) should take HRT.
- Just over 17% said all women should take HRT after menopause.
- 25% said only women with menopausal symptoms should take HRT.
- Nearly a third (30.2%) did not know which women should take HRT.

These same women (n=814) were asked what physical benefits they would expect from HRT.

- A third (33.7%) expected that HRT would cure menopausal symptoms.
- Nearly 15% said that hormone treatment would stop osteoporosis.
- The majority, however, (38.8%) answered that they did not know.
- Women who believed that those at risk of osteoporosis should take HRT were almost three times as likely as other women to be taking HRT themselves (RR 2.70, 95% CI: 2.02-3.58).
- Similarly, women who expected that hormone treatment would stop osteoporosis were twice as likely to be taking HRT themselves than those who did not expect this effect (RR 2.23, 95% CI: 1.69-2.96).
- This suggests that those taking HRT themselves are more aware of the benefits of HRT for osteoporosis.

When these asked if they would take HRT in the future:

- 12.2% said that they would.
- There was no association between planning to take HRT in the future and believing that those at risk of osteoporosis should take HRT (RR 1.05, 95% CI: 0.4-2.7).
• Those however who plan to take HRT in the future were 4 times more likely to expect HRT to stop osteoporosis (RR 4.4, 95% CI: 2.8-7.0).

4.8 Summary

Risk factors play a role in the development of osteoporosis. Some risk factors may be amenable to intervention and thus the prevention and intervention strategies can be implemented to reduce the impact and burden of osteoporosis.
5 The impact of osteoporosis

5.1 Fractures

As people age, not only do they lose bone density but they also become more likely to fall, due to loss of muscle tone, deteriorating vision and poor balance because of medication\textsuperscript{19}. This combination of factors makes older people more likely to experience bone fractures if they should fall. An Australian study found that there were 1848 falls per 100,000 population aged 65 years or more that required hospitalisation in the year 1997/8\textsuperscript{20}. This was equivalent to 45,069 episodes of hospital care. The incidence of falls is high for the elderly (as it is for children), with hospitalisation rates for falls in females over 80 years exceeding 4000 per 100,000 population\textsuperscript{20}. However males are just as likely as females to die from an accidental fall, despite the perception that they are less at risk of osteoporosis\textsuperscript{20}.

Fractures are a debilitating, painful and costly outcome of falls, and are much more likely if osteoporosis is present\textsuperscript{21}. Aside from the impact on the individual and their carers, there is also a substantial impact on the health system including hospital services, nursing homes and domiciliary care. In Australia during the financial year 1997/8, fractures were the principle diagnosis in 76\% of fall-related injuries for people aged 65 years and over who went to hospital, and resulted in 402,679 days in hospital\textsuperscript{20}. While vertebral fracture is the most common complication, hip fractures are probably the most costly and debilitating\textsuperscript{21,22}. The risk of fracture is higher in women, the lifetime risk of a hip fracture for a 50 year old white female has been shown to be 14\% compared to 3\% for a male\textsuperscript{23}. It is estimated that up to 50\% of patients become more dependent after a hip fracture, and there is a 10-20\% excess mortality associated with hip fractures\textsuperscript{23}. It has also been shown that 15\% of people admitted with a fractured neck of femur die in hospital and one third are dead within a year\textsuperscript{24}.

To assess the impact of fractures on the health system, South Australian hospitals data (ISAAC) were analysed to investigate the number of osteoporosis associated fractures and the length of stay in hospital.

Using the ICD10 coding for diseases, people hospitalised due to fractures attributed to osteoporosis (M80) were identified for the years 1999-2001. A total of 2347 persons in this two year period were hospitalised as a result of fractures attributed to osteoporosis, as shown in Table 3. Over 80\% of all patients were aged 70 years or
over, with the highest number of people in the 80-89 year age group. The same trend was observed in both years.

Table 3: Number of people hospitalised due to fractures attributed to osteoporosis, 1999-2001

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% &gt;70 years</td>
<td>n</td>
<td>% &gt;70 years</td>
</tr>
<tr>
<td>Male - public hospital</td>
<td>188</td>
<td>72.3%</td>
<td>182</td>
<td>76.4%</td>
</tr>
<tr>
<td>Male - private hospital</td>
<td>71</td>
<td>84.5%</td>
<td>85</td>
<td>92.9%</td>
</tr>
<tr>
<td>Females - public hospital</td>
<td>517</td>
<td>83.0%</td>
<td>575</td>
<td>83.1%</td>
</tr>
<tr>
<td>Females - private hospital</td>
<td>386</td>
<td>91.5%</td>
<td>343</td>
<td>92.7%</td>
</tr>
<tr>
<td>All Persons</td>
<td>1162</td>
<td>84.2%</td>
<td>1185</td>
<td>85.6%</td>
</tr>
</tbody>
</table>

Length of stay for these patients was variable, with an average 10-12 days in hospital (Table 4).

Table 4: Average length of stay (LOS) in days, per patient - Osteoporosis with pathological fracture - public and private hospitals, 1999-2001

<table>
<thead>
<tr>
<th></th>
<th>Average LOS (range)</th>
<th></th>
<th>Average LOS (range)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male - public hospital</td>
<td>10.3 (5.8 – 124)</td>
<td>14.7 (4.5 – 22.6)</td>
<td>12.0 (1.0 – 25.7)</td>
<td>12.5 (4.0 – 13.8)</td>
</tr>
<tr>
<td>Male - private hospital</td>
<td>11.2 (1.0 – 12.3)</td>
<td>12.5 (2.0 – 17.8)</td>
<td>11.3 (1.8 – 17.1)</td>
<td>12.4 (6.6 – 33.0)</td>
</tr>
</tbody>
</table>

Specifically hip fractures are a common outcome in those people who have osteoporosis and falls. The cost of the Medical Benefits Scheme item number for the surgical repair of hip fracture is approximately $630. Thus in 2000/01 the cost to the Medical Benefits Scheme in South Australia for treatment of fractured hips alone was approximately $750,000. This cost does not include length of hospital stay and thus an indication of the cost associated with the treatment of osteoporotic fractures can be obtained.

5.2 Implications

There are two approaches to reducing fractures due to osteoporosis. The first is to minimise the impact of osteoporosis, so that if people do fall, they are less likely to fracture. This involves maximising bone mass and minimizing bone loss. There is evidence from randomised controlled trials that drugs such as oestrogen and
treatments to decrease bone resorption have a beneficial effect on bone density and hip fracture\textsuperscript{23}. General practitioners should continue to be trained in recognising, diagnosing and treating osteoporosis at an early stage. The second approach is to stop people from falling. The risk of falling becomes greater as people get older due to weakening muscle tone, visual impairment and problems with balance due to age and medication\textsuperscript{19,25,26}. The prevention of falls has been the subject of several trials that have looked at modifying risk factors for falling, such as the home environment and exercise\textsuperscript{26}. Some of these trials have shown differences in the incident of falling but lacked the power to detect differences in fracture rates\textsuperscript{23}. Other studies have aimed to reduce the impact of falls by using external hip protectors, and a systematic review showed a decrease in hip fractures amongst those wearing the protectors\textsuperscript{23,27}.

### 5.3 Quality of life

Generic quality of life instruments are an important tool in assessing the impact of a condition on general well-being. Instruments such as the Short Form 36 (SF-36) explore a range of mental and physical health issues and enable the calculation of population norms\textsuperscript{28}. Sub-groups in the population can then be compared to the norms to see how they fare compared to the average person in the population. The SF-36 is a widely used instrument that has been validated for use in Australia\textsuperscript{29} and the concept of comparing sub-groups to population norms is well accepted\textsuperscript{29,30}.

The SF-36 contains 36 questions about health, wellbeing and functional ability, and is calculated into eight dimensions of physical and mental functioning: physical functioning (PF), ability to perform physical role (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), ability to perform emotional role (RE) and mental health (MH).

In the 1998 Autumn survey, all respondents answered the 36 questions to the SF-36. People with osteoporosis were then compared to people without osteoporosis by converting their dimension scores to standard scores. This method allows comparisons in terms of percentiles of the general population. The general population has a standard score of zero, which means that 50% of the population score above zero and 50% score below zero. Standard scores below zero indicate that the group is placed in the lower scoring percentiles of the general population. People with poorer health status will score at the lower end of the distribution of scores in a population. Conversion to standard scores involves subtracting the mean dimension score for the general population from the score for the group, and then dividing by the standard deviation of the general population.
Figure 5 shows the SF-36 scores for people with and without osteoporosis, controlled for age and gender. It can be seen that osteoporosis has a profound impact on functioning across all dimensions of the SF-36. People with osteoporosis are among the worst scoring 25% of the population on four dimensions, and substantially below the population without osteoporosis on the other dimensions.

Figure 5: SF-36 scores for people with and without osteoporosis.

5.4 Summary

Fracture is a significant outcome for those suffering from osteoporosis and impacts substantially on individuals, their families and the hospital system. Quality of life of those with osteoporosis is also significantly impaired, particularly physical functioning, general health, bodily pain and vitality. The risk of fall can be reduced following strategic interventions that modify associated risk factors thus reducing the burden on the health care system.
6 Beliefs and knowledge about osteoporosis and risk

Understanding risk of a disease is an important factor in changing behaviour and encouraging individuals to seek earlier diagnosis. It is especially important in a condition such as osteoporosis where the effects of the disease are not seen until much later in life, as there is a tendency for people to think ‘it won’t happen to me’. Being able to communicate risk effectively is a vital step in preventing chronic disease, however it appears to date this has not been done well for osteoporosis.

6.1 Risk of getting osteoporosis

Respondents to surveys in 1995, 1997 and 1998 (Spring) were asked if they perceived themselves to be at risk for getting osteoporosis in their lifetime. Respondents who had osteoporosis were not asked these questions.

- Overall, perception of risk was low, with the majority of people in 1997 and 1998 (around 75% of the sample) believing themselves to be at low or moderate risk.
- Less than 10% of respondents did not know what their risk was.
- In 1995, a slightly different risk perception question was asked, and 27% of respondents did not know what their risk was.
- The change in risk awareness (despite the slightly different question wording) suggests a heightening of awareness of osteoporosis, perhaps reflecting mass media advertising about osteoporosis over the time of these surveys.

6.1.1 Perception of risk, gender and age

- Women were two to three times more likely than men to perceive themselves at greater risk of getting osteoporosis.
- There was no difference between the proportions of men and women who did not know what their risk was.
- There was, however, an association between age and perceived risk of osteoporosis, with people less than 50 years more likely to believe themselves to be at risk.
- Age was also associated in 1995 and 1997 with having an unknown risk for osteoporosis, with people over 50 years more likely to not know their risk.
6.1.2 Perception of risk and place of residence

Place of residence was associated with risk perception in some years but not others.

- In 1995, women living in country areas were more likely to not know their risk or have a lower perceived risk than women in city areas, but this association was not evident in future years.
- The 1997 survey revealed that statistically significantly more country people believed they would not get osteoporosis (30.4%) than metropolitan residents (22%).

6.1.3 Educational attainment related to perception of risk

- As educational attainment increases, so does perception of risk for osteoporosis.
- This relationship is evident for both men and women in 1995 and 1998 and for women in 1997.
- Men and women who left school before 15 years were statistically significantly more likely to not know their risk than people with degree level education.

6.1.4 Summary of factors associated with perception of risk

The factors most strongly associated with perception of risk are gender, age and education, with area of residence a factor inconsistently associated with risk perception.

6.2 Knowledge of osteoporosis

In 1995, respondents were asked “What is osteoporosis”.

- Overall, almost half (49.8% n=1504) said they knew that it was either thinning or weak bones.
- A substantial proportion (26.1%, n=787) had never heard of it or had heard of it but weren’t sure.
- A further 24.0% (n=723) thought it was either a stiffness of joints (perhaps confusing it with osteoarthritis), partly knew or said it was some other condition.
6.2.1 Knowledge and gender

- Significantly more males (37.9%) did not know or were unsure about osteoporosis than females (14.6%, p<0.01).
- Females (62.2%) were statistically significantly more likely to know what osteoporosis was than males (37.2%, p<0.01).

6.2.2 Knowledge related to age and area of residence

- There was no association between age and knowledge of osteoporosis.
- Where people resided significantly affected whether they knew about osteoporosis, suggesting that country people may have less access to information than city people.
- Significantly more men (40%) and women (64%) who live in the city have accurate knowledge about osteoporosis compared with men (30%) and women (57%) who live in the country (p<0.01, p=0.01 respectively).
- Place of residence did not significantly affect those who had limited or inaccurate knowledge about osteoporosis for either gender (p >0.05).
- Significantly more men (43%) who reside in the country have no or uncertain knowledge about osteoporosis than city dwelling men (35%) (p<0.01).

6.2.3 Knowledge and education level

- For both men and women, increasing educational attainment is associated with an increasing proportion of people with accurate knowledge and decreasing proportion with limited or no knowledge about osteoporosis (p<0.01).
- Of the men who left school before 15 years, only 20.8% knew what osteoporosis was compared with 57.4% who have a degree. Nearly 85% of women who have a degree knew what osteoporosis was. (Table 5).
Table 5: Effect of education on knowledge of osteoporosis amongst men and women aged 15 years and over

<table>
<thead>
<tr>
<th>Education Attainment</th>
<th>% with accurate knowledge about osteoporosis</th>
<th>% with poor/inaccurate knowledge about osteoporosis</th>
<th>% with no knowledge or unsure about osteoporosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Left before 15 years</td>
<td>20.8</td>
<td>47.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Trade qualification</td>
<td>29.0</td>
<td>61.1</td>
<td>29.7</td>
</tr>
<tr>
<td>Certificate/Diploma</td>
<td>52.2</td>
<td>75.8</td>
<td>22.3</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>57.4</td>
<td>84.8</td>
<td>23.3</td>
</tr>
</tbody>
</table>

6.2.4 Knowledge and income

- A significantly higher proportion of females who earn more than $50,000 per year gave an accurate description of osteoporosis than females who earn less (p<0.01).
- As income levels decrease, significantly more females and males said they did not know or were unsure they knew what osteoporosis was (p<0.01, p=0.02 respectively).

6.2.5 Summary of factors associated with knowledge of osteoporosis

Thus, knowledge of osteoporosis is associated with gender, place of residence, education status and income, but not with age.

6.3 Factors which cause osteoporosis

Respondents were then asked specifically what factors caused osteoporosis, and shown a prompt card with the factors shown in Figure 6.

- Age was stated as a cause by 59% of respondents.
- The age of the respondent was significantly associated with knowledge of risk factors (age, lack of calcium, small body size or lack of regular weight bearing exercise).
- Respondents under 50 years of age were significantly better informed than older people on age, lack of calcium, lack of regular exercise (p<0.0005) but not on body size (p=0.7).
- Females were significantly more informed than males about these specific factors (p<0.005).
• More highly educated people were significantly more informed than less educated people (p<0.005).
• Place of residence also significantly affected knowledge levels about body size and exercise (p<0.001) but not age or calcium (p>0.1).
• As income levels increased, the proportion of people who knew about age, calcium and exercise as factors causing osteoporosis rose significantly (p<0.005).
• The proportion who knew about body size was not related to income (p=0.6).
• Amongst those who said they did not know what factors caused osteoporosis there were significantly:
  • More people 50 years and older than people aged 15-49.
  • More males than females.
  • More people residing in the country than in the city.
  • More people from lower socioeconomic groups as measured by income and educational status (p<0.01)

**Figure 6: Knowledge of factors causing osteoporosis**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of calcium in diet</td>
<td>86.0</td>
</tr>
<tr>
<td>Age</td>
<td>59.0</td>
</tr>
<tr>
<td>Lack of regular weight-bearing exercise</td>
<td>35.6</td>
</tr>
<tr>
<td>Don't know</td>
<td>8.4</td>
</tr>
<tr>
<td>Small body size</td>
<td>6.4</td>
</tr>
<tr>
<td>High cholesterol levels</td>
<td>5.5</td>
</tr>
<tr>
<td>Lack of fluoride in diet</td>
<td>5.4</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>5.3</td>
</tr>
<tr>
<td>High dietary sugars</td>
<td>4.2</td>
</tr>
<tr>
<td>Lack of salt in diet</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Note: Multiple responses possible
6.4 Calcium intake and osteoporosis

- Half of the respondents who do not currently have osteoporosis that they know of \( (n=2918) \) knew that their current calcium intake was sufficient to reduce the risk of osteoporosis in the future but 28% did not know if this was the case.
- Significantly more males (32.5%) than females (23.6%) did not know if their calcium intake was sufficient \( (p<0.01) \).
- More people older than 50 years (33.2%) than younger people (25.5%) did not know if their calcium intake was sufficient \( (p<0.01) \).
- Generally males were 38% more likely to not know their calcium requirements \( (RR 1.38, 95\% CI: 1.22-1.55) \).
- Educational status and income levels were inversely related to knowledge of calcium levels \( (p<0.001, p=0.02 \text{ respectively}) \).
- Place of residence was not associated with knowledge about calcium \( (p=0.4) \).

6.5 Changes to lifestyle because of osteoporosis

In 1995, respondents to the survey were asked if they had taken any measures to prevent or to treat osteoporosis. They were given a choice of several actions and opportunity to volunteer other measures.

- Of the 95 people who had been told by a doctor that they have osteoporosis, all but five took one or more measures to treat osteoporosis.
  - More than half (57%) did some exercise.
  - Three quarters (76%) increased their calcium intake.
  - 27% took HRT.
  - 7% took other measures.

- Of the respondents who had not been told they have osteoporosis \( (n=2918) \):
  - 22.5% were not taking any measures to reduce the risk of osteoporosis in the future.
  - The remaining respondents reported that they were taking one or more measures, as shown in Table 6.
It was also noted that:

- Significantly more males (28.6%) than females (17.9%) were not taking any measures to prevent osteoporosis (p<0.01).
- Taking measures to prevent osteoporosis was inversely related to educational status (p<0.01). Indeed, those who left school before 15 years of age were almost twice as likely not to be taking any measures to reduce the risk of getting osteoporosis than those who had completed a degree (RR 1.90, 95% CI: 1.44-2.51).

### 6.6 Implications

People generally underestimate their risk of developing osteoporosis, particularly older people who are most at risk of the condition and its effects. Continued efforts to raise awareness amongst the public and amongst general practitioners who have contact with those at risk is needed to ensure that osteoporosis is better understood and recognised. This will facilitate better prevention and treatment of the condition.
7 References


