

2.10 Oral diseases

With over 19 million untreated decayed teeth, dental caries (tooth decay) is the most prevalent chronic condition affecting health reported in the Australian population. It is estimated that there were almost 11 million newly decayed teeth in 1996, making dental caries the second most commonly occurring condition after upper respiratory tract infections.

Other oral diseases are also very common. The most common clinical consequences of oral disease are infection and tooth loss. Oral diseases are also associated with pain and discomfort; eating difficulties; and problems with speech, communication and socialising.

Description

A number of disorders are included in oral diseases, and range from mouth ulcers, oral cancer, tooth impactions, misaligned teeth and jaws, to trauma to the teeth and mouth.

There are two main forms of oral diseases:

- 1 dental caries (tooth decay), caused by acid-producing bacteria that live in the mouth. Types of caries include early childhood caries, coronal caries, root caries and secondary caries.
- 1 periodontal (gum) diseases, a group of inflammatory diseases that affect the gums, deeper connective tissues and the jaw bone, all of which support and protect the teeth.

Disease severity

Tooth decay can progress from demineralisation of the tooth or its root (which can lead to cavities) to infection of the tooth pulp, abscess formation, fracture of the tooth, and tooth loss. Gum diseases involve inflammation of the periodontal tissues which can be associated with recession of the gums or formation of periodontal pockets in the gums. These pockets may lead to advanced destruction of tooth support resulting in tooth mobility, formation of gum abscesses, and tooth loss.

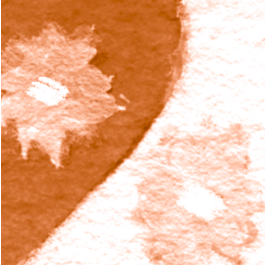
Risk factors

The risk of oral disease and disorder is shaped by the physical environment (e.g. water fluoridation); the social and economic environment including the home, school, work and neighbourhood; individual behaviour; and genetic endowment. Tooth decay can occur at any age after teeth erupt and is therefore a health issue for all age groups. Caries-causing bacteria infect the mouth and proliferate on a diet of very sweet or sticky foods. Medical conditions and medications that alter the flow of saliva can increase the risk of caries, especially in the elderly. The most common forms of gum diseases are associated with increased age, smoking, infrequent dental visits, low education and income levels, and some medical conditions (Page 1995), especially diabetes (Genco 1996) and osteoporosis (Jeffcoat & Chestnut 1993).

Impacts

Deaths

While most oral disease problems are not usually life-threatening, there are some deaths related to oral diseases, primarily oral cancers. Oral cancers (ICD-9 codes 140–146, 149) represent approximately 4.1% of new cancers in males and 2.2% in females. In 1998, 549 Australians died from oral cancers (AIHW & AACR 2001:42–3.).



Incidence/prevalence

Dental problems are very common in the population and are ranked as the fourth most frequent illness condition, behind headache, high blood pressure and colds (Spencer & Lewis 1988). In 1995, dental problems were the fourth most frequently reported condition among children from birth to age 14, affecting 6% of boys and 7% of girls (AIHW 1998:16).

The number of decayed, missing and filled teeth due to dental caries increases with age. By age 20, over 90% of the population in 1987–88 had experienced some dental caries (Barnard 1993). The average number of untreated decayed teeth was highest at 1.8 for those aged 25–29. Persons with teeth missing as a result of dental caries comprised 76% of those aged 35–44, and there were over 17 missing teeth per person aged 65 and above. Filled teeth increased to a high of 10 per person aged 30–34.

Most of the Australian population has some mild gum disease at any given time. Only a small proportion of Australians has severe gum disease affecting their teeth. Of the population aged 10 or more in 1987–88, the most recent year for which information is available, 22% had periodontally healthy mouths, while 15% had periodontal pockets 4–5mm, and 3% had periodontal pockets 6mm or more in depth (Table 2.10.1).

Losing all natural teeth (edentulism) increases as age increases, as shown in Figure 2.10.1. This reflects both the cumulative loss of teeth over time and previous patterns of dental treatment. In 1996, 49% of persons aged 74 years or more were edentulous.

In only 54% of Australians in 1987–88 was malocclusion (misaligned teeth and jaws) judged to be absent, while severe malocclusion was present in 12% of people (Barnard 1993). Some treatment for malocclusion was judged to

Table 2.10.1: Periodontal problems of persons aged 10 or more, 1987–88

Periodontal condition	Per cent
Calculus	34
Periodontal pockets, 4–5mm	15
Periodontal pockets, 6mm or more	3
Bleeding of gums on probing	11
Edentulous (no natural teeth)	13
No periodontal problem	22

Source: Barnard 1993.

be needed by 11%, and 6% were having or had completed treatment.

In 1996, there were 178 babies born with either cleft lip, cleft palate or both. Over the period 1987 to 1996 there were approximately six cases of cleft palate and nine cases of cleft lip per 100,000 live births each year (Hurst et al. 1999).

A total of 2,625 new cases of oral cancers were diagnosed in 1997 (AIHW & AACR 2000). The lip (45%), tongue (17%) and floor of mouth/other mouth (15%) were the most common sites of these new cases of oral cancer. A comparison of the number of new cases with the number of deaths from oral cancers indicates that survival rates are high.

Oral diseases in population subgroups

There are some marked social and regional differentials in Australia in the levels of oral diseases. In 6-year-old children, those living in areas representing the most disadvantaged quarter of the population experience almost twice as much caries as children living in areas representing the least disadvantaged quarter. People with lower education status and in less skilled occupational groups experience higher rates of edentulism (complete tooth loss) and tooth extraction.

There is also a clear relationship between occupation and the social impact of oral diseases and disorders. When three occupational groups were compared, people in more highly skilled or highly paid occupational groups reported less social impact as measured by the Oral Health Impact Profile, and showed a clear gradient across the dimensions of physical, psychological and social disability, and handicap associated with dental problems (Yanga-Mabunga 1998).

In 6-year-old children, caries experience increases from metropolitan to rural and remote locations. Twelve-year-old children living in rural areas fare worse than both urban-dwelling and remote-dwelling children, as shown in Figure 2.10.2. In addition, older Australians living in rural areas are more likely to be edentulous (have no natural teeth) and more likely to wear a denture than those living in urban areas.

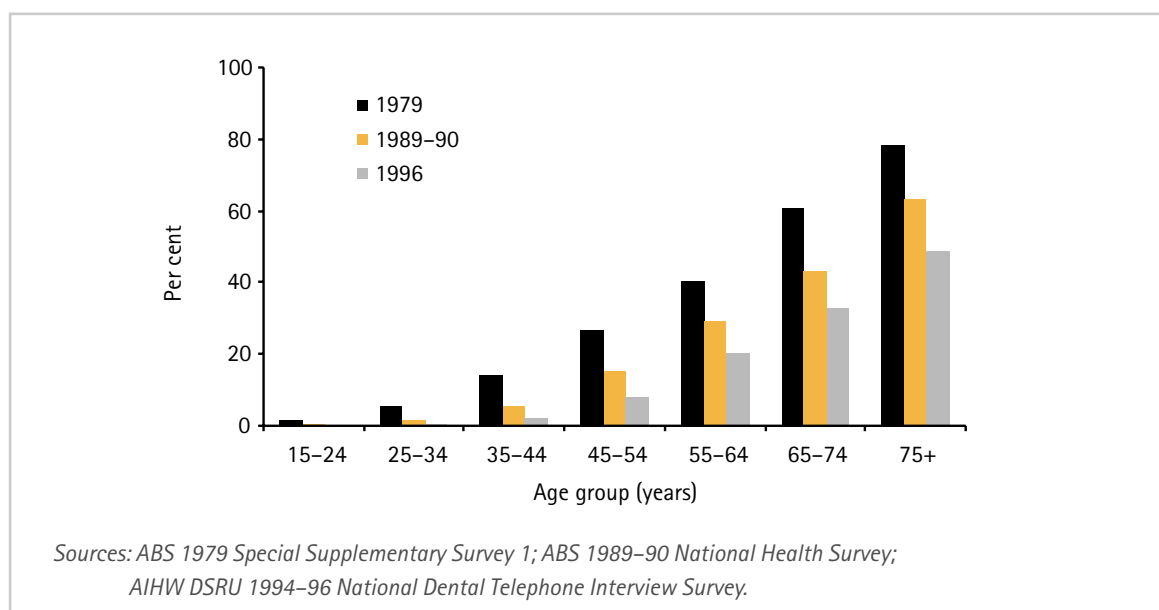
Indigenous Australians are more likely than non-Indigenous Australians to have lost all their teeth, have gum diseases, and receive less caries

treatment. High rates of tooth loss in Indigenous adults are associated with the high prevalence of mature onset diabetes in that community. Severe periodontal disease is more prevalent for Indigenous Australians for all ages above 35. The early stages of poorer periodontal health are evident in Indigenous Australians aged 18–24.

Quality of life

The social impact of oral diseases and disorders is widespread and significant across the Australian population, as shown in Figure 2.10.3. Nearly half of the adults with no natural teeth and 40% of those with some natural teeth reported experiencing discomfort, when eating, in the previous 12 months. Pain from teeth, gums or dentures was reported by approximately one-third of Australian adults. Self-consciousness related to oral health problems was reported by 20% of Australian adults. Approximately one in ten adult Australians who had their own natural teeth reported diminished taste, having to alter their

Figure 2.10.1: Edentulous persons, by age group, 1979 to 1996



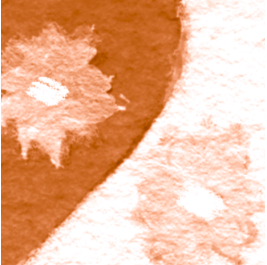


Figure 2.10.2: Children's experience of decayed, missing or filed teeth, by geographic location, 1996

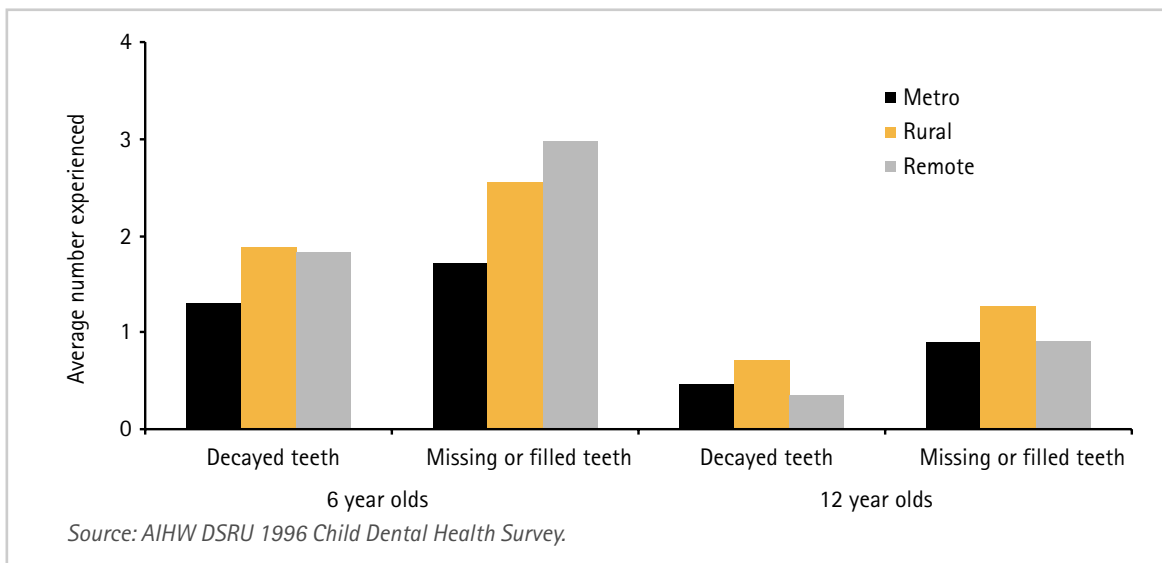
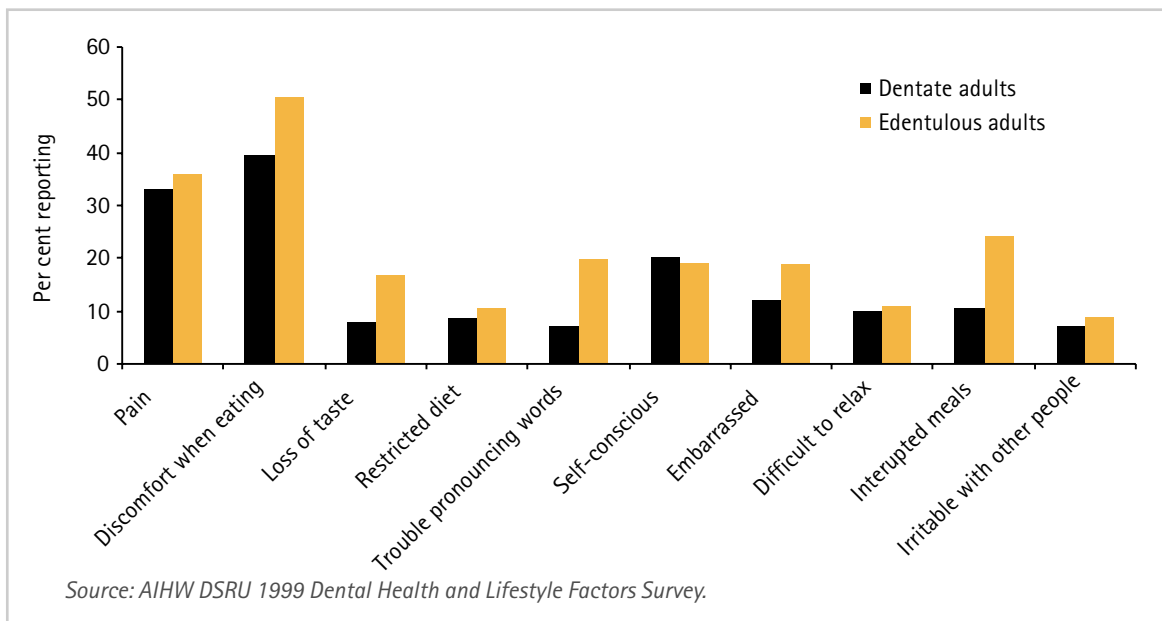


Figure 2.10.3: Social impact of oral diseases and disorders in last 12 months, 1999



diet, difficulty pronouncing words, embarrassment, difficulty relaxing, having to interrupt meals and being irritable because of their teeth, gums or dentures in the previous 12 months (AIHW DSRU: unpublished data, 1999 Dental Health and Lifestyle Factors Survey).

Use of health services

Some oral diseases and conditions such as oral cancers and oral trauma may be treated in hospital settings. There are also dedicated public dental hospitals in some capital cities that provide public dental treatment to eligible patients. Most dental problems are treated by general dental practitioners in either private or public clinics.

Oral trauma resulted in Australians being admitted to hospital at a rate of 67 per 100,000 people (AIHW NISU, unpublished data). This includes only hospital admissions where oral injury was the principal diagnosis, not all admissions that include an oral injury. Oral trauma not resulting in hospitalisation is also substantial, with an estimated 24 cases of oral trauma per 1,000 children aged 6–12 years (Stockwell 1988).

The benefits of regular dental visits are shown in Figure 2.10.4. People whose most recent visit was for a dental problem were more likely to have a gap of over 5 years since their previous visit (17%), compared to those who came for a check-up (3%). Conversely, of those whose last visit was for a dental problem, only 41% had visited in the past year while 72% of those visiting for a check-up had visited in the last year.

Differences in access are evident by age group. There is a sharp increase in visiting for a dental problem from adolescents (25% for ages 12–17) to young adults (over 40% for ages 18–24) after which the proportion of problem visiting remains fairly constant. In children, the greater use of dental services for check-up visits reflects

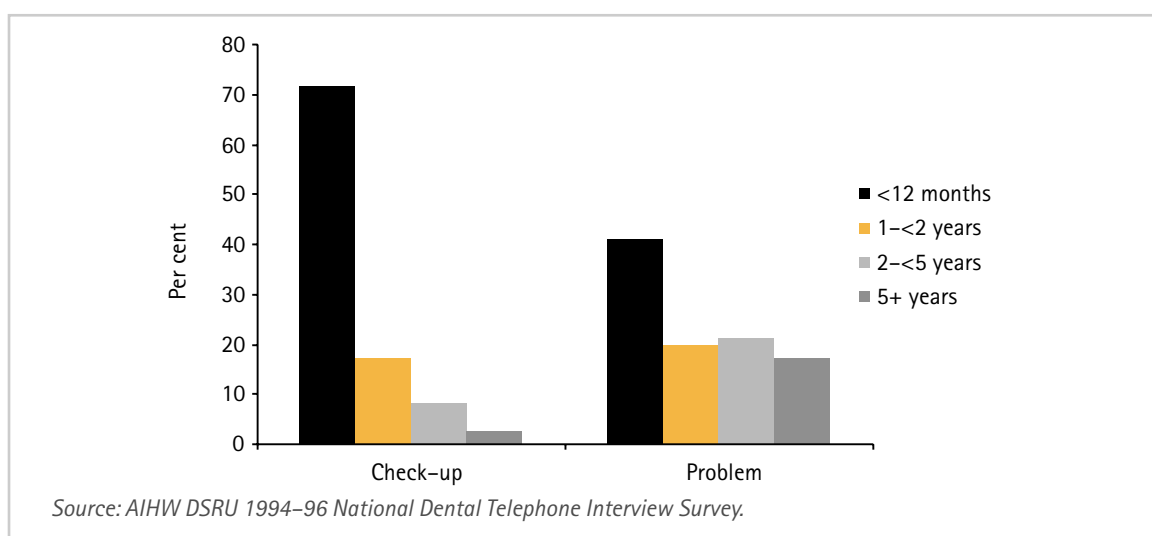
the availability of services through the school dental services. In Australia as a whole, only 6% of those aged 6–12 had not made a dental visit in the previous 2 years. This increased to 10% for ages 13–16.

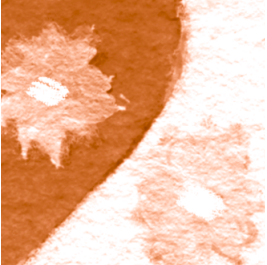
Costs

The high burden of illness from oral diseases and disorders is reflected in the costs of dental health care services. The direct costs to the health care system of oral disease in 1997–98 totalled more than \$1.9 billion per year, or 4% of total health expenditure. Dental caries has been estimated to account for approximately 70% of this amount.

These costs do not include indirect costs of oral diseases and disorders to individuals, or the cost to society of lost work days, school days, or productivity (AIHW: Mathers & Penm 1998:2). For example, 21% of workers in 1996 reported taking time off work for a check-up, 16% reported taking time off for a problem, and 29% continued to work despite having a dental problem, but possibly with reduced productivity (Yanga-Mabunga 1998).

Figure 2.10.4: Time since last visit by dentate adults coming for a check-up or for a problem, 1994–96





Management

Tooth and gum disease can be controlled, as evidenced by the use of fluoride, by tooth and gum brushing, by cessation of smoking, or by fillings and other treatments. The body's protective mechanisms, including saliva, play an important role in limiting tooth damage from caries-causing bacteria. Even if caries reaches an advanced stage, a tooth can be retained if infection is controlled, diseased tissue removed and replaced, and the form and function of the tooth restored (e.g. through root canal treatment).

Prevention

Oral diseases are largely preventable. When they occur, interventions are available to limit their progress, alleviate pain and suffering and restore function. The major types of oral disease are dental caries and periodontal disease. Both of these ultimately lead to tooth loss if not treated, but are largely preventable and reversible if detected and treated early. Currently about 90% of all tooth loss can be attributed to these two categories of diseases. Therefore, most tooth loss is avoidable.

Oral health needs in Australia are addressed implicitly in a number of ways, including nutrition and general health programs. Examples of primary prevention in oral health include water fluoridation, toothpaste fluoridation, education and awareness raising, and access to preventive dental services such as those offered by the school dental services provided by State and Territory health authorities. Secondary and tertiary prevention are generally offered by dental health care workers in clinical settings.

Water fluoridation

Considerable oral health gains from the prevention and control of dental caries, especially for children and adolescents, are associated with an increased exposure to fluoride, through both water fluoridation and toothpaste with fluoride (Spencer 1986a, 1986b; Spencer et al. 1994). Between 1964 and 1971, six of Australia's capital cities introduced water fluoridation. Melbourne was not fluoridated until 1977. In most Australian States and Territories, some three-quarters of the resident population now has access to fluoridated water supplies. Brisbane is the only non-fluoridated capital city.

School dental services

In the 1970s, the Commonwealth Government funded the development of infrastructure and the education of dental therapists as the workforce for school dental services. These services achieved high coverage of the target primary school population in all States and Territories other than New South Wales and Victoria. Most services were then extended through the secondary school population.

The range of care provided throughout Australia in the school dental services is similar, covering basic restorative and preventive care, and some limited orthodontic care. The school dental services have shown themselves to be effective in reaching a high percentage of children. The unit cost of the services is low and the health outcomes continue to improve, providing an excellent base on which the oral health of Australians can be built.

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2.11 Arthritis

Arthritis is a group of disorders in which there is inflammation of the joints, causing chronic pain, stiffness, disability and deformity. The two most common forms are osteoarthritis (ICD-9 code 715; ICD-10-AM codes M15–M19) and rheumatoid arthritis (ICD-9 codes 714.0–714.2, 714.31–714.33, 714.4–714.9; ICD-10-AM codes M05–M06). Arthritis imposes a heavy economic burden on the community, including in-patient and out-patient care, nursing home care, medications and lost productivity. Most of the arthritic conditions are of unknown cause and allow little opportunity for prevention. However, good management can address problems associated with some components of the disease.

Description

Arthritis (inflammation of the joints) can result from injury, infection, accumulated wear or auto-immunity. Most episodes of joint inflammation are resolved when healing has been completed, but in some cases the inflammation does not remit.

There are more than 100 known types of arthritis, of which osteoarthritis and rheumatoid arthritis account for the majority of cases. Other types include fibromyalgia, lupus, gout, spondylitis, bursitis, tendonitis and carpal tunnel syndrome.

Symptoms of arthritis include stiffness, pain and swelling of joints, most commonly in the fingers, toes, wrists, knees, elbows and ankles. The effects are usually symmetrical, affecting the same site on both sides of the body around the same time. Although it primarily affects the joints, rheumatoid arthritis can also affect the connective tissue throughout the body, particularly those related to the lungs, heart and eyes (Scott & Hochberg 1998:472).

Osteoarthritis is a degenerative joint disease affecting primarily the hands, spine and weight-bearing joints such as hips, knees and ankles. The disease begins in cartilage overlying the ends of joint bones, and is caused and accelerated by mechanical forces, disrupting the normal function of the joint. Pain is initially experienced in the joints during and after activity, but as degeneration progresses it may

occur with only minimal movement or even during rest (AIHW 2000:100).

Rheumatoid arthritis is an auto-immune disease involving chronic inflammation of the joints, beginning with the membranes lining the joints and spreading to other joint tissues. The inflammation may damage the cartilage in the joint and erode adjacent bones. This damage and the reduced use of the joint can lead to deformities.

While most cases of arthritis occur at ages above 20 years, a form of rheumatoid arthritis, juvenile rheumatoid arthritis (ICD-9 code 714.30; ICD-10 code M08) occurs in children. The disease resembles adult rheumatoid arthritis in most respects, but may also have some distinctive patterns, including fever, rash and enlarged spleen, particularly in the systemic form (US NLM 2001).

Disease severity and complications

Most forms of arthritis are chronic in nature, although intermittent or episodic in presentation. Only a few forms can be completely cured. Juvenile rheumatoid arthritis often improves or remits at puberty, with approximately 75% of cases having minimal functional loss and deformity (US NLM 2001).

Pain is the most common outcome of most forms of arthritis. This can be compounded by destruction of the cartilage and underlying bone in the joint, often resulting in disability and

restrictions in normal activities. While such deformities are not usually life-threatening, mortality can occasionally result if the cervical spine becomes unstable (Katz 2000).

Rheumatoid arthritis often has additional features that do not involve the joints. Rheumatoid nodules (painless, hard, round or oval masses under the skin) are present in about 20% of cases. Occasionally these occur in the lungs, causing pleurisy (inflammation of the lining) and shortness of breath. Fibrosis (scarring) in the lung is reported to occur in 20% of persons with rheumatoid arthritis. Anaemia may occur due to failure of the bone marrow to produce enough new red cells to make up for the lost ones.

More serious complications of rheumatoid arthritis include vasculitis (inflammation of the blood vessels) which can lead to skin ulcerations or stomach ulcers. Vasculitis may also affect the brain, nerves and heart, causing stroke, heart attack or heart failure. Heart complications include pericarditis (inflammation of the outer lining) and myocarditis (inflammation of the heart muscle itself), both of which can lead to congestive heart failure (Katz 2000).

Risk factors

Genetic factors play an important role in a person's predisposition to arthritis. The precise genetic links vary for each type. Increasing age is a risk factor for both rheumatoid arthritis and osteoarthritis. The tendency to auto-immunity is also a risk factor for rheumatoid arthritis.

Females have a greater risk of rheumatoid arthritis. Females aged 54 and above are also at greater risk for osteoarthritis, but this is not necessarily the case at younger ages (March 1997:99; Scott & Hochberg 1998: 468–70, 473).

While there are no well-established behavioural risk factors for rheumatoid arthritis, a number of these have been identified for osteoarthritis

(Box 2.11.1). The major modifiable risk factors are joint trauma, obesity and repetitive joint usage. A history of joint trauma is the strongest risk factor for osteoarthritis at either the knee or the hip. Obesity has been demonstrated to be a weight-bearing factor in osteoarthritis of the knee. Occupations requiring knee-bending have been associated with knee osteoarthritis, and farming has been associated with hip osteoarthritis. Recreational activities, including running and other sports, are not associated with the development of osteoarthritis among people who have not had prior joint injuries (Scott & Hochberg 1998:469–70).

Box 2.11.1: Risk factors for osteoarthritis

Predisposing factors

Genetic
Sex
Age

Environmental and behavioural factors

Joint trauma and injury
Obesity
Repetitive occupational joint use
Physical inactivity

Sources: March 1997:99; Scott & Hochberg 1998:468–70.

Co-morbidities

Arthritis coexists with a variety of diseases and conditions. While some of these may be no more than associated features of ageing, they are more likely to occur in arthritis sufferers because these diseases and conditions share common risk factors with arthritis, such as excess weight, previous joint injury and the tendency to auto-immunity.

Osteoarthritis is more likely to develop in people with prior inflammatory joint diseases such as gout or rheumatoid arthritis. Since osteoarthritis is in part a result of obesity and

lack of exercise, it may also occur together with heart and vascular diseases and Type 2 diabetes.

Diseases associated with rheumatoid arthritis include respiratory and infectious diseases, gastrointestinal disorders and non-Hodgkin's lymphoma (Scott & Hochberg 1998:473). Rheumatoid arthritis is also the most common cause of secondary amyloidosis, in which deposits of a waxy, starch-like protein (amyloid) can decrease the function of tissues, including those in the heart and brain (Wollheim 1993:648). Some of these co-morbidities are considered to reduce the life expectancy of people with rheumatoid arthritis.

Research in the USA has found that depression is much higher among adults with rheumatoid arthritis (between 14% and 27%) than in the general population (5%). This is probably because over half of those with rheumatoid arthritis are forced to make some changes in their work schedule, with resulting financial pressures, and over 70% are unable to participate in recreational activities. Another stress factor leading to depression is the uncertainty about the progression of the disease (Access Economics 2001:6).

Impacts

Deaths

Arthritis is listed as an underlying cause of relatively few deaths. In 1998, there were 86 deaths in Australia recorded as being due to osteoarthritis, and 135 due to rheumatoid arthritis. However, rheumatoid arthritis is believed to be associated with excess mortality. Causes of death that are more frequent in persons with rheumatoid arthritis include respiratory and infectious diseases and gastrointestinal disorders. Some of the mortality associated with gastrointestinal disorders may be due to the complications of

therapy for arthritis (Scott & Hochberg 1998:473).

Prevalence

The ABS 1995 National Health Survey found that 2.7 million Australians (nearly 15% of the population) suffered from some form of arthritis, with about 60% of these being females. Of this total, 1.2 million had osteoarthritis and more than 476,000 had rheumatoid arthritis, with prevalence rates of 64 per 1,000 and 26 per 1,000 respectively. A recent projection of these figures to June 2000 indicates that an estimated 3.1 million Australians have arthritis, or 16.5% of the population. This estimate compares to 18% in the USA, 16% in Canada, and 14% in the UK and Europe (Access Economics 2001:6–7).

The strong relationship between arthritis and ageing is reflected in the increasing prevalence of the condition with age (Figure 2.11.1). Relatively few people at younger ages report having arthritis, but by age 65 over half of females and a third of males in Australia report having some form of arthritis.

The prevalence of both osteoarthritis and rheumatoid arthritis follows a similar pattern of increasing sharply with age (Figure 2.11.2). For both conditions, the prevalence is greater in females at nearly all ages.

Disability

Arthritis can lead to disability due to restricted mobility from severe joint pain. The ABS 1998 Survey of Disability, Ageing and Carers found that nearly half a million Australians (497,000) had a disability due to arthritis, about 14% of all persons with a disability. Nearly two-thirds (66%) of these were females. Disability due to arthritis was particularly marked in the older age groups (Figure 2.11.3). At age 65 and above, 16% of females and 10% of males had a disability due to arthritis.

Figure 2.11.1: Age-specific prevalence of arthritis (any form), 1995

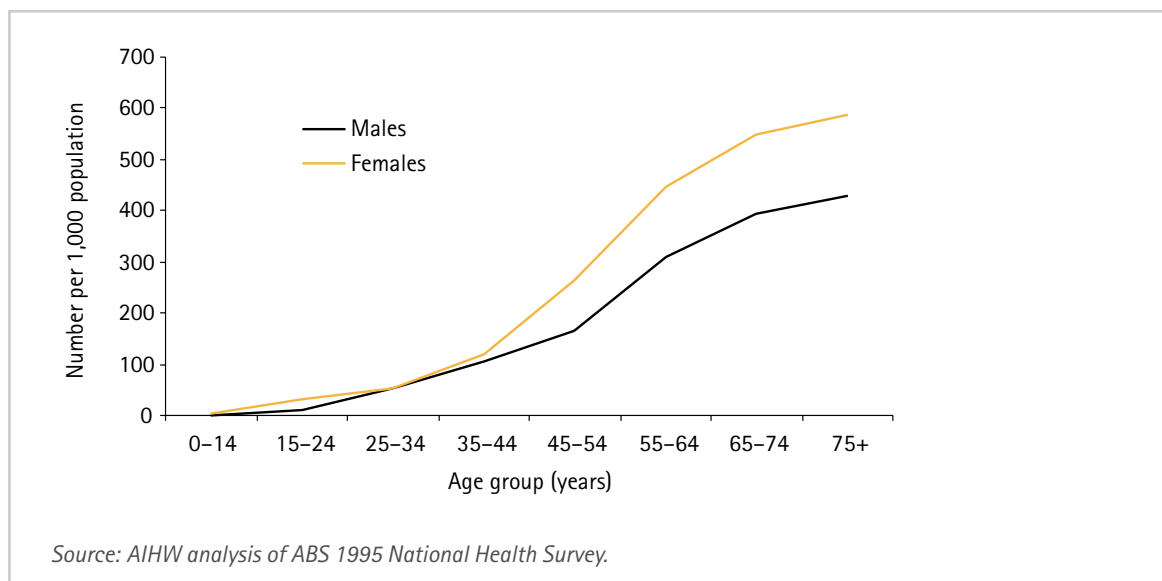
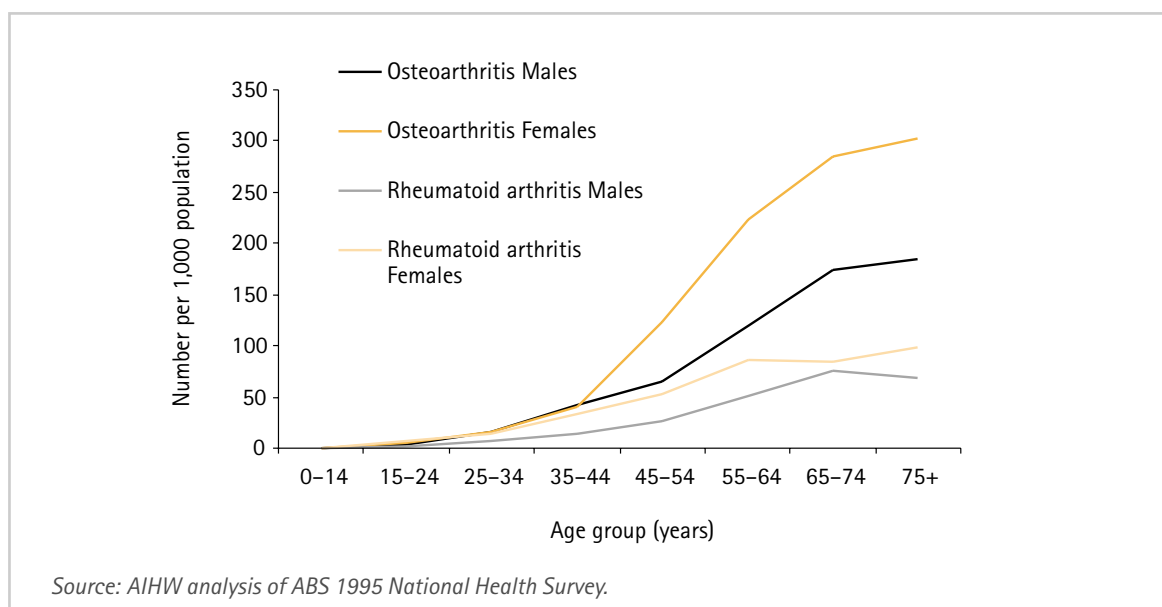


Figure 2.11.2: Age-specific prevalence of osteoarthritis and rheumatoid arthritis, 1995

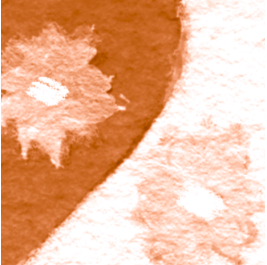


Use of health services

Arthritic conditions are among the most frequently managed problems in general practice, representing 2.4% of all problems managed in 1999–00. Osteoarthritis alone represented 1.5% of all problems managed, ranking it as the tenth most frequently managed problem (AIHW: Britt et al. 2000:39). Osteoarthritis is also the third most

common problem for which imaging is ordered by GPs, after back pain and fracture, being 4.1% of all imaging orders (AIHW: Britt et al. 2001:47, 92).

Hospital separations for osteoarthritis have increased by 42% over the past 7 years, from 39,186 in 1993–94 to 55,758 in 1999–00. There are far fewer separations for rheumatoid arthritis, and these have declined over the



same 7-year period, from 6,179 to 5,135. Average length of stay in hospital for both conditions in 1999–00 was over 6 days (6.5 days for rheumatoid arthritis and 6.4 days for osteoarthritis).

Health system costs in 1993–94 were estimated to be \$624 million for osteoarthritis, nearly half (48%) of which was for hospital services. A further 19% was for nursing home care, 13% for medical care (mainly GPs), and 9% for pharmaceuticals. Costs for rheumatoid arthritis were \$129 million, with 34% of this going to hospital services, 21% each to medical care and pharmaceuticals, and 14% to nursing home care (AIHW: Mathers & Penm 1999:19).

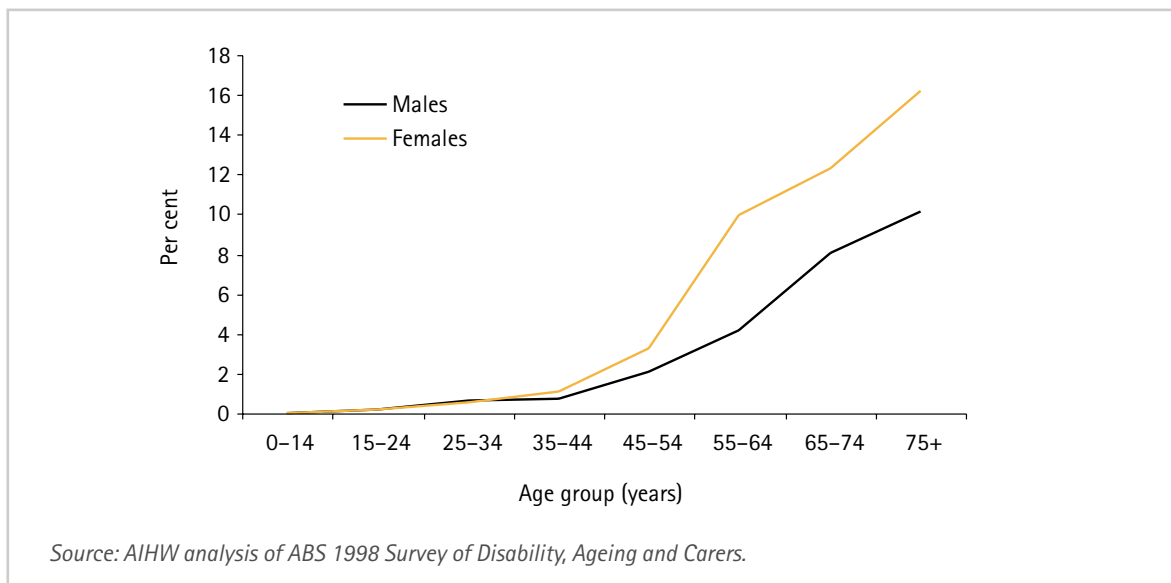
Management

Most types of arthritis cannot be fully cured, but it is possible to provide relief for many sufferers and delay progression of the condition. The goals of treatment for arthritis therefore are to provide pain relief, increase motion and improve strength.

For osteoarthritis, weight loss and exercise to strengthen bones and muscles are important. Anti-inflammatory drugs, such as COX-2 inhibitors, are preferable to pure analgesic agents in relieving pain in osteoarthritis because they have fewer gastrointestinal complications. Recent research suggests that glucosamine sulfate retards the progression of symptomatic knee osteoarthritis. In advanced cases not responding to treatment, surgical joint replacement is a cost-effective intervention (Brooks 2001:S91).

Early diagnosis and aggressive treatment with disease-modifying, anti-rheumatic drugs are important in treating rheumatoid arthritis. A range of new drugs, particularly the monoclonal antibodies, can significantly improve outcomes, at least in the short term. Surgical joint replacement also can be considered, but it does not appear to cure the disease (Brooks 2001:S91). An appropriate public health intervention, given the excess mortality from respiratory and infectious diseases among

Figure 2.11.3: Age-specific prevalence of disability due to arthritis, 1995



patients with rheumatoid arthritis, is immunisation against pneumonia and influenza (Scott & Hochberg 1998:474).

Studies of self-management interventions have found that education programs provide significant improvements in outcomes for arthritis patients in comparison to anti-inflammatory drug treatment alone (Superio-Cabuslay et al. 1996).

Prevention

Due to the auto-immune nature of rheumatoid arthritis, prevention is not a major focus of efforts. Limited primary prevention measures have been identified for osteoarthritis. On the basis of current knowledge of risk factors, avoiding joint trauma, preventing obesity and modifying occupational-related joint stress through ergonomic approaches can all help prevent osteoarthritis (Scott & Hochberg 1998:470).

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2.12 Osteoporosis

Osteoporosis or 'porous bones' (ICD-9 code 733.0; ICD-10-AM codes M80–M82) is a condition characterised by the progressive loss of bone density, thinning of bone tissue and skeletal fragility. It is a major cause of morbidity, deformity, disability and poor quality of life among the elderly, particularly females, due mostly to fractures and related complications. Osteoporotic fractures can impair physical functions, often leading to dependency in older people. The cost to the community from osteoporosis, particularly in terms of health system expenditure, is high. Its impact is likely to increase further with the ageing of the population.

Description

Osteoporosis results when calcium dissolves from the bones, leaving them porous and weak. Reduction in bone tissue is accompanied by deterioration in the architecture and strength of the skeleton, increasing risk of fracture, and substantial pain and disability. It occurs more frequently in older persons as bone tissue is progressively lost with ageing, but the rate of deterioration varies widely between individuals.

Most experts define osteoporosis as skeletal bone mineral density of more than two standard deviation units below the average value for young adults (a t-score of -2.0 ; the WHO definition is a t-score of -2.5). Persons with this level of bone loss are at a high risk of fracture. Those with t-scores between -1.0 and -2.0 , a condition known as osteopenia, are at an increased risk of fracture.

Fracture depends as much on injury as on bone density, but the loss of bone through osteoporosis increases the risk of fracture with minimal or no trauma. The risk of fracture increases by a factor of approximately two for each standard deviation unit below the mean (O'Neill 1997:1183).

Fractures of the hip among older adults, especially when they occur in association with minimal or moderate trauma, are considered to be related to osteoporosis.

A major Australian study, using information obtained from radiology services, the Dubbo Osteoporosis Epidemiology Study, estimated that after age 60 about 56% of females and 29% of

males suffer a fracture due to osteoporosis (Wark 1996:327). The proportion increases with age.

Disease severity and complications

The diagnosis of osteoporosis is made mostly following fractures of the spine, hip (especially the neck of the femur), wrist or other areas of the skeleton. Many epidemiological studies use fracture as a surrogate indicator of osteoporosis because of difficulties in measuring bone density (Scott & Hochberg 1998:476).

The various fracture sites have different sex ratios and incidence rates in different decades of life. Fracture-associated mortality also varies with age and site. For example, hip fractures result in considerable mortality, although this may reflect the greater presence of coexisting morbidity in older people.

Osteoporotic limb fractures are usually precipitated by falls, whereas the precipitating factor in vertebral fracture is often being lifted or lifting a heavy weight (Nuki et al. 1999:869). Back pain from compression fractures of the thoracic vertebrae is a common problem among the elderly.

Hip fractures are a particularly serious outcome of osteoporosis, as virtually all persons with a hip fracture are hospitalised for treatment. There were 14,600 hip fractures in 1994, mostly due to osteoporosis, and this number is expected to increase to 20,900 in 2010 (ANCC 1997:S5). Two-thirds of persons who fracture a hip do not return to their pre-fracture level of functioning,

with many of these requiring nursing home care. Studies in Australia and the USA suggest that mortality within a year of hip fracture is 24%, about five times higher than that in an age-matched group who did not suffer a hip fracture (ANCC 1997:55; US CDCP 2001:4, 12–3).

Risk factors

There are many known risk factors for osteoporosis (Box 2.12.1). High in importance are those that affect bone mass development and loss over an individual's life span (Figure 2.12.1). Bone mass increases during growth years to reach a peak between the ages of 25 and 35 and falls thereafter in both sexes, with an accelerated phase in females mainly due to a deficiency of oestrogen (which has a central role in maintaining and balancing bone mass) following menopause.

Genetic factors also are important in the origin and development of osteoporosis; family studies suggest that genetic influences account for 70–85% of individual variation in bone mass (Nuki et al. 1999:868).

Box 2.12.1: Risk factors for osteoporosis

Predisposing factors

Being female

Family history

Low levels of oestrogen after menopause

Amenorrhoea lasting more than 6 months before the age of 45

Early menopause (before age 45)

Environmental and behavioural factors

Low body weight

Low calcium intake

Low vitamin D levels

Being immobile

Lack of exercise

Smoking

Alcoholism

Use of corticosteroids

Sources: O'Neill 1997:1188; Nuki et al. 1999:869.

Of the behavioural and environmental factors known to influence bone mass in normal individuals, the most important are lack of exercise and low calcium intake during growth and adolescence. Excessive exercise in females, in association with oestrogen loss, can also result in opposing effects of mechanical stress and hormone deficiency in the skeleton.

Calcium intake is also important in determining the rate of post-menopausal bone loss, along with vitamin D levels, which affect absorption of calcium. Low body weight is associated with low bone mineral density. Osteoporosis may also occur as a result of corticosteroid drug treatments, tobacco smoking and alcohol abuse (Nuki et al. 1999:868–9; Access Economics 2001:3).

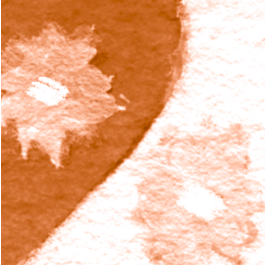
Co-morbidities

Several medical conditions are associated with an increased risk of osteoporosis, including chronic liver disease, chronic renal disease and rheumatoid arthritis. Two metabolic disorders have also been identified in association with osteoporosis. One of these, known as hyperparathyroidism, involves excessive production of parathyroid hormone, which increases the blood calcium level by reabsorbing calcium from the bones. The other is a condition among males known as hypogonadism, wherein a decreased or absent secretion of hormones from the gonads causes increased loss of bone mass (O'Neill 1997:1188).

Impacts

Deaths

Only a small number of deaths (93 in 1998) are recorded as being caused by osteoporosis. However, the number of deaths due to falls among the elderly, many of which can be



attributed to osteoporosis, is large. The Burden of Disease and Injury Study, using attributable fractions by age and sex for six fracture sites, estimated that 523 deaths in 1996 were attributable to osteoporosis (AIHW: Mathers et al. 1999:74–5). In 1998, there were 1,014 deaths of persons aged 65 and over for which the external cause was an accidental fall, and in over half of these (551) hip fracture (fracture of neck of femur) was listed as the cause or one of the causes of death (AIHW: Cripps & Carman 2001:15).

Prevalence

There are several estimates available of the prevalence of osteoporosis in Australia. Based on self-reports in the 1995 ABS National Health Survey, an estimated 248,000 people had osteoporosis. Among females, the prevalence was 105 per 1,000 among those aged 65–74, and 123 per 1,000 among those aged 75 and above (Figure 2.12.2). Comparable rates among males were 12 and 15 per 1,000 respectively.

The Burden of Disease and Injury Study has estimated that in 1996 over 155,000 Australians suffered from osteoporosis. The prevalence of osteoporosis among females was estimated to be more than four times that among males: 13.7 per 1,000 females compared with 3.2 per 1,000 males (AIHW: Mathers et al. 1999:74, 209).

A much larger estimate of the prevalence of osteoporosis has been produced by Access Economics (2001:9), by including proportions of those reporting back problems, curvature of the spine, other musculoskeletal diseases, fractures from injuries, and osteoporosis from secondary sources. This method produces an estimate of 1.8 million people with osteoporosis in 1995.

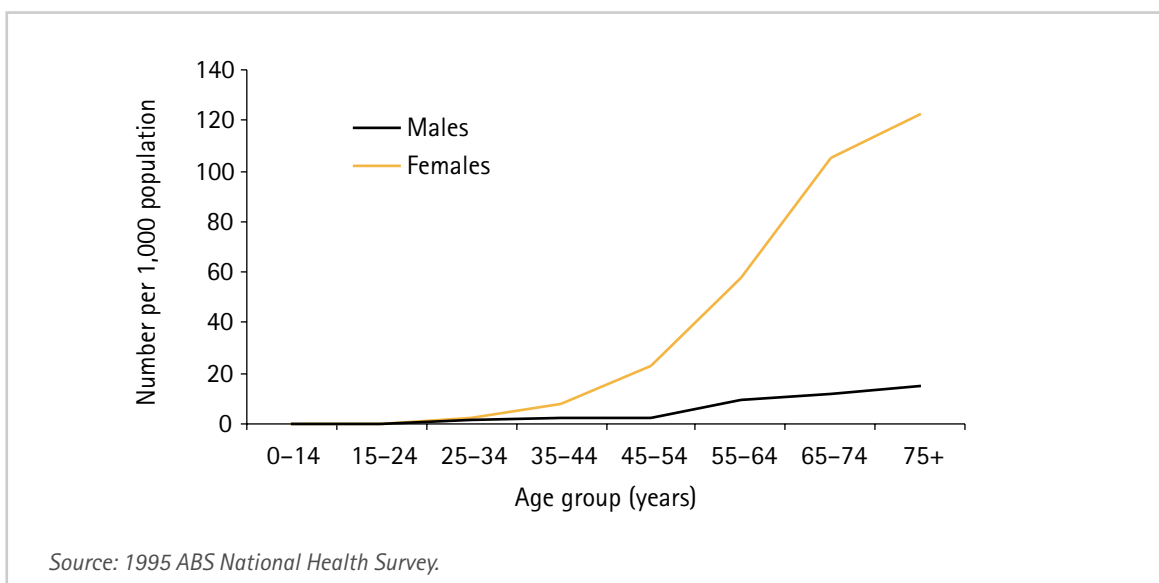
Disability

The 1998 ABS Survey of Disability, Ageing and Carers estimated that over 29,100 persons had a disability due to osteoporosis as the main cause, 85% of these being females. The rate of

Figure 2.12.1: Changes in bone mass with age

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Please refer to the printed publication.

Figure 2.12.2: Age-specific prevalence of osteoporosis, 1995



disability due to osteoporosis in females aged 75 and over was estimated to be 13 per 1,000. The survey also estimated that a total of 96,100 persons with a disability had osteoporosis.

Use of health services

In 1999–00, there were 7,059 hospital separations for which the principal diagnosis was osteoporosis; 60% of these separations also listed fracture as reason for hospitalisation. The average length of stay for this latter group was over 12 days.

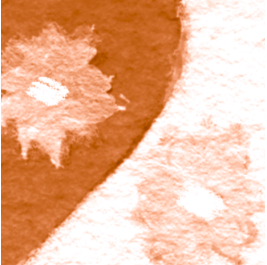
In the same period there were 27,260 separations for fractures that were likely to be the result of osteoporosis. These were closed fractures of the vertebrae, arm or hip (neck of femur) as a result of falls among people aged 50 and above (see Harris et al. 1998:44–5 for a detailed explanation and ICD-9 codes). Over three-quarters (78%) of these separations were of females.

There are several estimates of the costs of osteoporosis to the community. These estimates vary considerably, due to the different assumptions and methodologies used. The

AIHW study of health system costs produced an estimate for osteoporosis in 1993–94 of \$60 million. This estimate includes the costs of diagnosis and treatment of osteoporosis per se, while most of the costs for fractures resulting from osteoporosis are classified in the AIHW study as injury costs associated with fractures and falls (AIHW: Mathers & Penm 1999:9–10).

In addition to the \$60 million costed for osteoporosis in the AIHW study, Access Economics (2001:13) estimated osteoporotic fractures in 1993–94 to cost \$296 million. Another large category for osteoporosis-related health system costs, \$950 million, included kyphosis (curvature of the spine), back problems and osteoporosis from secondary sources. The resulting total estimate by Access Economics of the health system costs for osteoporosis in 1993–94 was \$1.3 billion.

The Dubbo Osteoporosis Epidemiology Study estimated the cost of treating osteoporotic fractures in persons aged 60 and over in Australia to be \$779 million in 1992, with 54% of the total being attributable to hip fractures (Wark 1996:327). This estimate included rehabilitation and other community costs. In



contrast, an analysis by the Centre for Health Program Evaluation produced an estimate for 1994 of \$227 million, much closer to the estimate generated by Access Economics. Almost two-thirds of this amount (\$141 million) was for hospital in-patient care, and 85% of this care was for hip fractures (Harris et al. 1998:35–6).

Management

A number of lifestyle measures are advised for managing osteoporosis, including recommendations for lifestyle modification, pain relief and fall prevention measures that may prevent the progression of osteoporosis or fractures. However, at present there are no approved drug treatments to increase bone density once it is lost. A reasonable level of physical activity (30–60 minutes of moderate weight-bearing exercise on 3–4 days per week) can improve strength, stability and balance, thus reducing the risk of falls. Calcium intake should be at an adequate level (800 mg/day for pre-menopause females and 1,000 mg/day for post-menopause). Medications that predispose to bone loss (corticosteroids, thyroxine therapy, anticonvulsants) should be minimised, as should medications that predispose to falls (O'Neill 1997:1189).

Prevention

It is easier to prevent than to treat established osteoporosis. There are two main approaches to the prevention of osteoporosis. The first, optimising the attainment of peak bone mass, begins in childhood and includes maintaining a good diet with an adequate intake of calcium. An active lifestyle, with an emphasis on weight-bearing physical activities such as walking, is also important, as is discouraging smoking and excessive alcohol consumption (Scott & Hochberg 1998:481).

The second approach is to slow the rate of bone loss with ageing. A number of drug treatments, including hormone replacement therapy (HRT), are available. For females, oestrogen replacement started at the time of menopause seems to retard or prevent bone loss and reduce fracture risk for as long as the oestrogen is taken (Scott & Hochberg 1998:480). According to self-reported information in the 1995 ABS National Health Survey, 25% of females aged 45–54 and 30% of those aged 55–64 were using HRT (ABS 1997:60). Testosterone replacement is appropriate for males with osteoporosis caused by hypogonadism (O'Neill 1997:1190).

A 1996 national consensus conference on osteoporosis concluded that mass screening for low bone density is not required at present. The likelihood of poor attendance at screening programs, poor uptake and compliance with therapy, and the relatively low efficacy of available treatments (30–50%) suggest that the cost of a mass screening program would not be justified by any resulting change in the incidence of fractures in the whole community (ANCC 1997:S7–S8). Measurement of bone mass should, however, be considered for specific population groups: oestrogen deficient females, patients with vertebral fracture, patients receiving long-term glucocorticoid therapy, and patients with asymptomatic primary hyperparathyroidism (Scott & Hochberg 1998:482).

The risk factors for falling should also be addressed as part of an osteoporosis prevention program. An environmental assessment to help older persons 'fall-proof' their living areas is advisable. Typical actions from such assessments include installing optimal lighting; providing hand rails on stairs, toilet and bath areas; removing throw rugs and extension cords; placing soft corners on cabinets and furniture; and providing appropriate footwear to prevent tripping (Scott & Hochberg 1998:482).

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