



The high price of pain: the economic impact of persistent pain in Australia

November 2007

Report by Access Economics Pty Limited for

MBF Foundation

in collaboration with

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Institute

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GLOSSARY OF COMMON ABBREVIATIONS

ABS	Australian Bureau of Statistics
AF	Attributable Fraction
AIHW	Australian Institute for Health and Welfare
AWE	Average Weekly Earnings
BoD	burden of disease
CATI	Computer-Assisted Telephone Interviewing
CPG	Chronic Pain Grade
DALY	Disability Adjusted Life Year
DSP	Disability Support Pension
DWL	deadweight loss
IASP	International Association for the Study of Pain
IDDS	implanted drug delivery systems
MPC	Multidisciplinary Pain Clinic
MRR	Mortality rate ratio
NHPAs	National Health Priority Areas
NHS	National Health Survey
NOHSC	National Occupational Health and Safety Commission
NA	NewStart Allowance
NSA	Northern Sydney Area
NSW	New South Wales
OOH	out of hospital
OR	odds ratio
PPP	purchasing power parity
QALY	Quality Adjusted Life Year
SA	Sickness Allowance
SDAC	Survey of Disability, Ageing and Carers
SES	socioeconomic status
SMR	standardised mortality ratio
VSL/VSLY	Value of a Statistical Life (Year)
WHO	World Health Organization
YLD	Years of healthy life Lost due to Disability
YLL	Years of Life Lost due to premature mortality

Cost effectiveness: a comparison of the relative expenditure (costs) and outcomes (effects) of two or more courses of action.

Deadweight loss: is the loss of consumer and producer surplus, as a result of the imposition of a distortion to the equilibrium (society preferred) level of output and prices. DWL occurs when some people could be made better off without others being made worse off. Common causes are monopoly pricing, externalities, taxes or subsidies.

Multicollinearity: is a statistical term for the existence of a high degree of linear correlation among two or more explanatory variables in a regression model. This makes it difficult to separate the effects of them on the dependent variable.

Transfer payment: is a financial flow between entities in an economy that of itself does not use real resources eg. taxation revenues or welfare transfers.

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EXECUTIVE SUMMARY

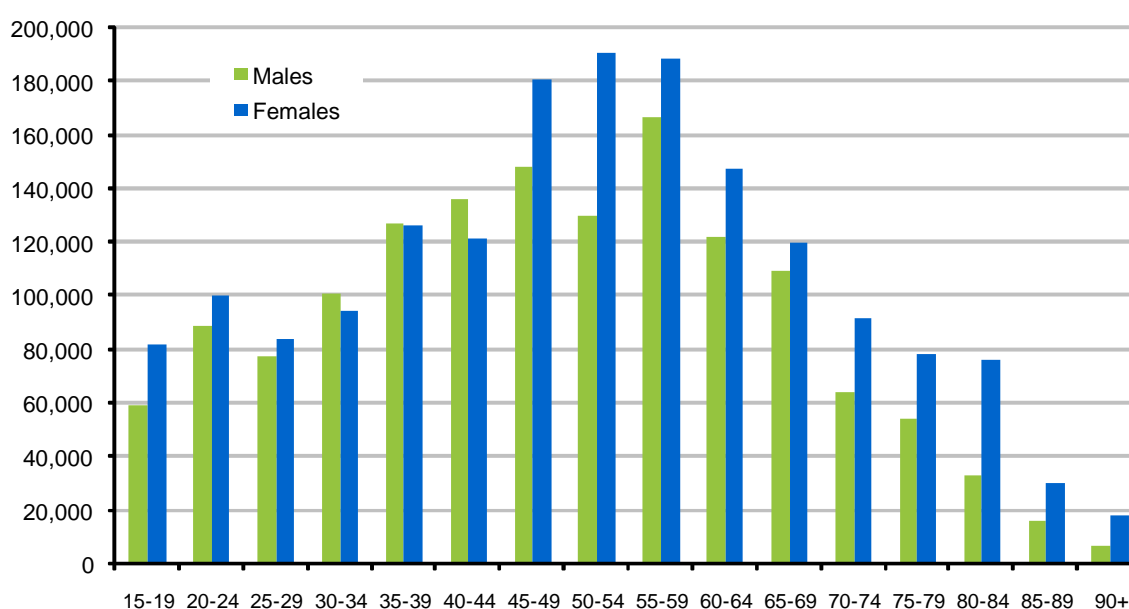
This report was commissioned by the MBF Foundation in collaboration with the University of Sydney Pain Management Research Institute to estimate the economic impact of chronic (or persistent) pain in Australia in 2007.

Prevalence in Australia

Chronic pain is a complex biopsychosocial phenomenon that can have a profound impact on people's lives. The condition persists beyond the normal time of healing and is conservatively defined as pain experienced every day for three months or more in the previous six months.

Chronic pain is a surprisingly common condition in Australia. **In 2007, around 3.2 million Australians (1.4 million males and 1.7 million females) are estimated to experience chronic pain.**

Prevalence of Chronic Pain, 2007



Source: Based on New South Wales (NSW) Health Department (1999) and Blyth et al (2001).

The **prevalence of chronic pain is projected to increase as Australia's population ages** – from around 3.2 million Australians in 2007 to 5.0 million by 2050.

- Of these, females bear a greater share of chronic pain, over 54% for the projection period.

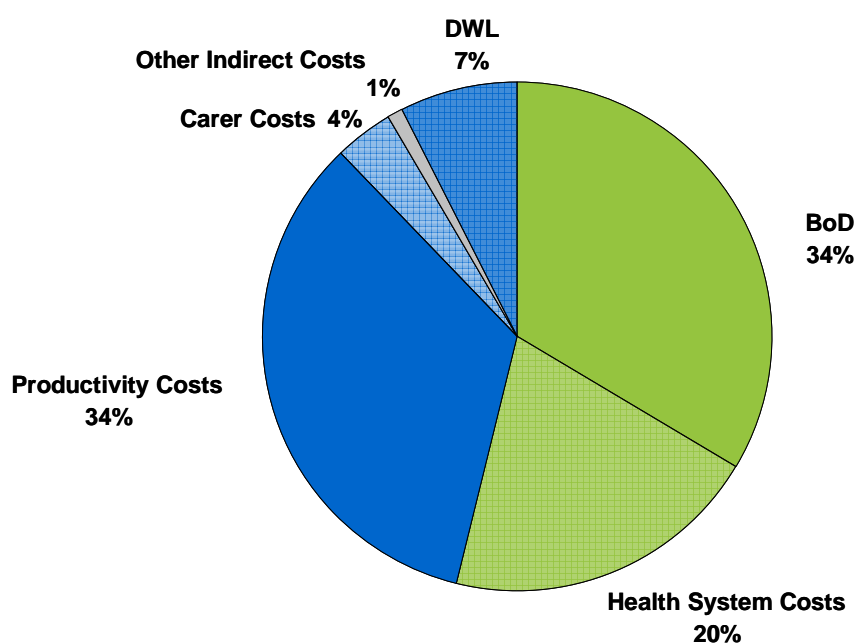
Economic Impact

Chronic pain has a substantial economic impact on society, reflecting both its prevalence, and the broad and significant impacts on people who experience it and those caring for them. Not only does a person living with chronic pain have an impacted quality of life, but those who would otherwise be economically productive often have reduced productivity as an outcome. This, as well as the relationship between chronic pain and socioeconomic disadvantage, makes it an important public health concern in Australia.

The total cost of chronic pain in 2007 was estimated at \$34.3 billion – or \$10,847 per person with chronic pain.

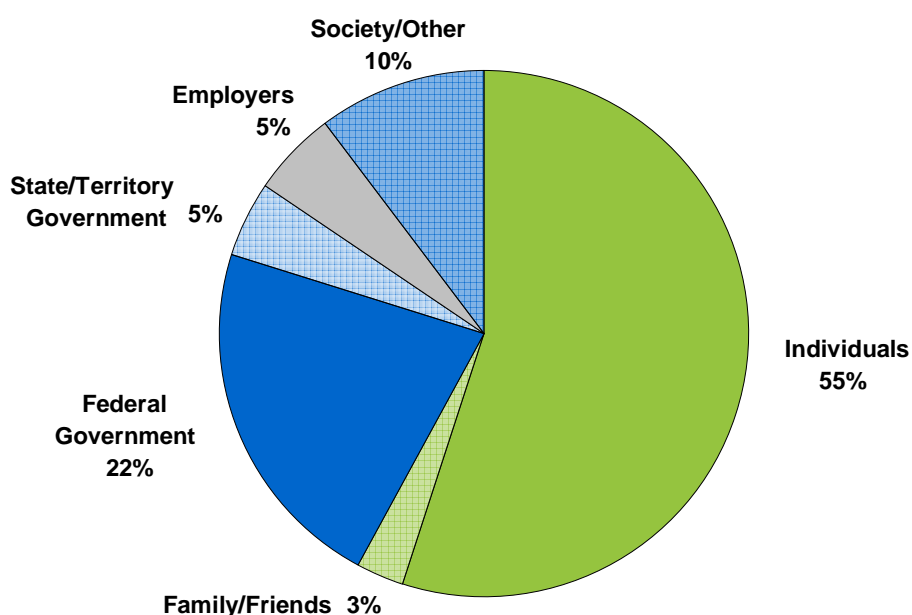
- Productivity costs are the largest component, making up around \$11.7 billion (34%) and reflecting the relatively high impact on work performance and employment outcomes caused by chronic pain.
- The burden of disease (BoD) accounts for the next largest share at around \$11.5 billion (also around 34%).
- Health system costs represent a further \$7.0 billion (20%) - capturing the considerable inpatient, outpatient and out of hospital medical costs, as well as smaller costs such as pharmaceuticals, other professional services and residential aged care.
- The opportunity cost of informal care is around \$1.3 billion (4%), while other indirect costs (such as aids and modifications) are around \$0.3 billion – or 1% of total costs.
- Deadweight losses (DWLs) from transfer payments (taxation revenue forgone and welfare payments – notably the Disability Support Pension and NewStart Allowance) comprise the final \$2.6 billion (7% of total estimated costs).

Total Costs of Chronic Pain by Type, 2007



Note: BoD – means burden of disease; DWL – means deadweight losses.

Total Costs of Chronic Pain by Bearer, 2007



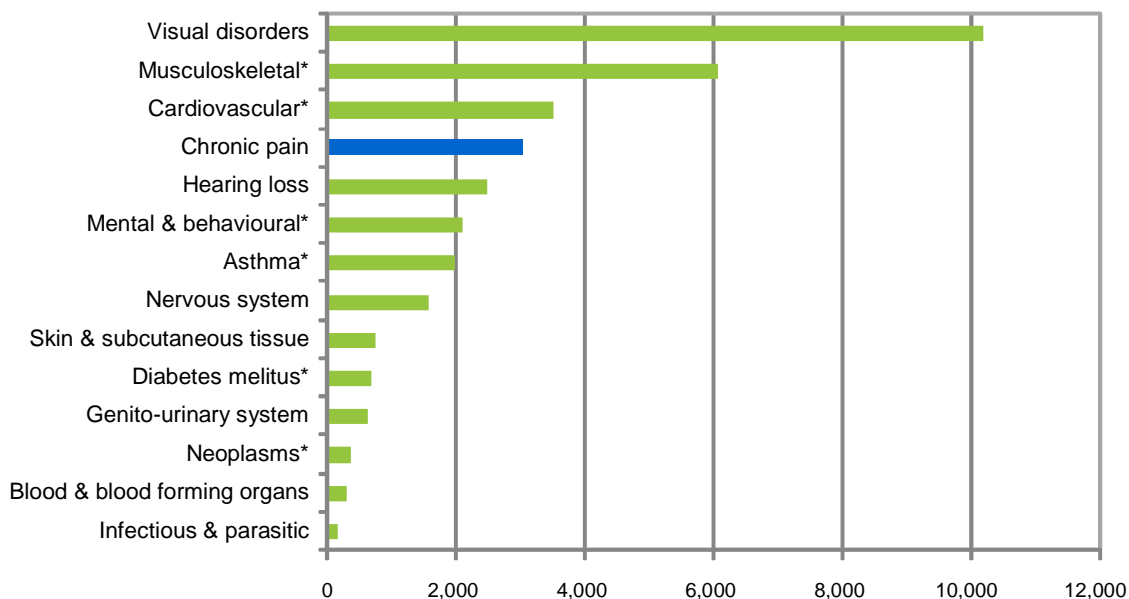
The largest share of chronic pain costs is borne by the individuals with chronic pain themselves who, principally due to the large BoD costs, bear 55% of total costs; 22% of total costs are borne by the Federal Government, due primarily to their share of health system and productivity costs. Employers bear 5%, State Governments 5%, family and friends bear 3%, while the remaining 10% is borne by society.

Comparison with other conditions

In 2005, the most recent year for which comparable prevalence data on all diseases are available, chronic pain prevalence was comparable or higher than a number of National Health Priority Areas (NHPAs). NHPA conditions include cardiovascular disease, cancer, musculoskeletal diseases, injuries, mental disorders, asthma and diabetes.

It should be noted that chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

Prevalence Comparisons – Chronic Pain and Other Conditions, 2005



Prevalence (thousands of people).

* National health priorities.

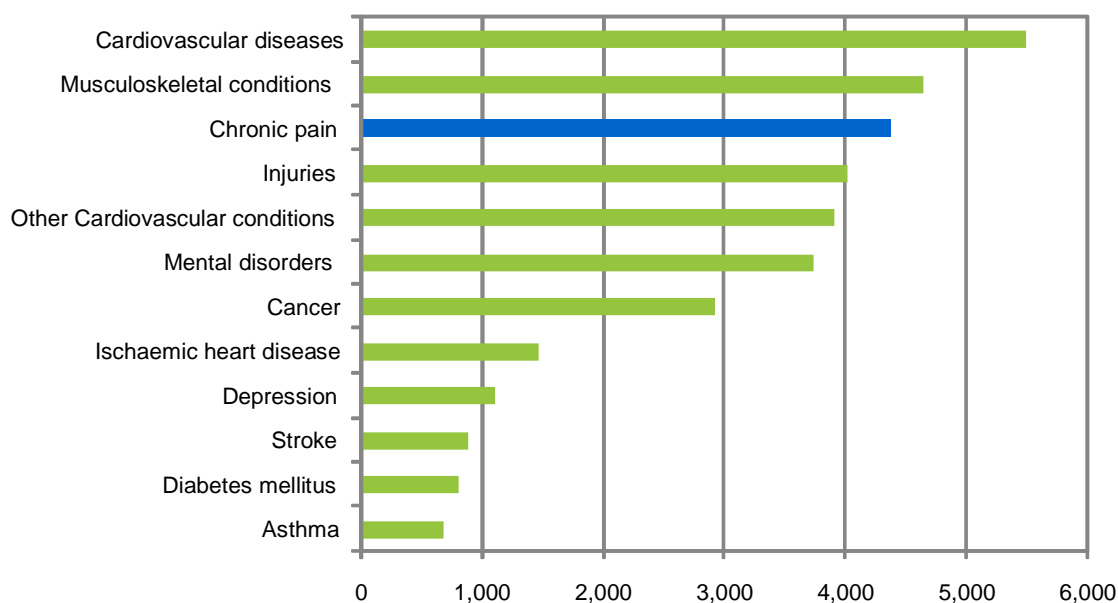
Source: Access Economics based on the Australian Bureau of Statistics (ABS) National Health Survey (NHS) 2004-05.

Note: Chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

Allocated health expenditure on chronic pain was estimated at around \$4.4 billion in 2000-01 – the most recent year for which there are comparable disease health expenditure data. This was third only to cardiovascular diseases and musculoskeletal conditions among the NHPAs, while noting the overlap between costs of chronic pain and its underlying causes.

- This outcome is consistent with the prevalence and impact of chronic pain and means estimated spending on chronic pain ranks highly relative to many of the NHPAs – outstripping allocated health spending on conditions such as injuries, diabetes and mental disorders.

Health Expenditure Comparisons, Chronic Pain and Other Conditions, 2000-01 (\$ Million)



Source: Access Economics based on the Australian Institute of Health and Welfare - AIHW (2005).

Note: Chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

Cost Effective Interventions

It is important to recognise that for many people, pain is not managed optimally, so that there is broad scope for reducing the economic and social impacts as they currently stand. There is a growing emphasis on developing multidisciplinary management strategies for chronic conditions such as chronic pain. Chronic pain currently imposes very substantial costs on the health care system. The term 'effective' needs to be defined for chronic pain – it refers to minimising the impact of persisting pain on a person's lifestyle (quality of life), and reducing use of health services.

- The cost effectiveness literature on chronic pain treatments is in need of further development. Economic evaluations of community-wide and primary care based treatments are needed, given the size of the problem of chronic pain in the Australian community. Community based treatment is appropriate for most people with chronic non-disabling pain.
- The coordinated multidisciplinary approach is not only the most effective way of helping patients to manage their chronic pain, but it can also be the most cost effective for more disabled chronic pain patients.
- In cancer patients with persistent pain, there are major differences in treatment options compared to non-cancer pain, because of limited life expectancies and clear-cut underlying causes of pain.
- Behavioural approaches focus on improvement in functional activities despite pain and can be sufficient on their own or in combination with other modalities, most importantly active physiotherapy.
- Pharmacological treatments can be effective in reducing symptoms but are not always needed and may not be sufficient alone to improve functional status. There are

concerns that over-reliance on pharmacological treatments can lead to poorer functional outcomes and substance-related problems.

- Surgical interventions, like spinal cord stimulation, are expensive but can be cost effective, though only in selected cases and often require additional input from behavioural approaches.

Future Research Challenges

There are a number of areas where data are non-existent or data quality could be improved.

- There is a lack of data on the prevalence of chronic pain in children (between the ages of 0-14 years). While the experience of experts in the field suggests that chronic pain in children is at least as prevalent as that experienced by adults, the lack of survey data makes the impact difficult to estimate.
- More research is required on the progression from acute to chronic pain and from non-disabling chronic pain to disabling chronic pain.
- There is a lack of data on mortality (including suicide) associated with chronic pain – particularly for Australia.
- There is a lack of data on chronic post-surgical pain in Australia.
- There is a lack of data on assessment and management of pain in older people, especially those with cognitive impairment.
- Because so much chronic pain is currently difficult to identify, it can also be difficult to apportion the health and other costs due to chronic pain. An Attributable Fractions approach was taken in this report to estimate health system costs. However, a more detailed and direct analysis of health costs would be beneficial, controlling for other factors. This would also assist in relation to the BoD calculations, where there is also need for better estimation of disability weights for chronic pain, including by severity.
- There are few Australian data on cost effectiveness of commonly used interventions for chronic pain, at the individual, systems (eg. workplace) or community level.
- There is a need for more research on the impact of chronic pain on productivity through sickness presenteeism.

Strategic Directions

Chronic pain can be best managed in a collaborative and multidisciplinary fashion. Improved outcomes will require appropriately trained health professionals to assess and treat the broad range of problems in people with chronic pain.

- Persistent pain usually follows on from an acute phase. Efforts to prevent progression from acute to chronic pain are most likely to reduce the disability and economic costs associated with chronic pain. Assessment is critical as soon as someone is not back to normal functioning as expected after initial treatment.
- Pain relief must not be the only goal. Treatments need to address functional goals and obstacles to progress. Simply addressing pain severity alone is unlikely to be sufficient in promoting functional goals.
- Timely multi-dimensional assessment, management, and triage in primary care settings with early referral for multi-disciplinary pain assessment (if required) are needed since, in many cases, no single treatment is likely to be enough. If more than one treatment provider is involved, a coordinated (and consistent) treatment plan is essential.

- For those people with chronic, disabling pain the best evidence available (and broad consensus by experts in the field) is that a collaborative and multidisciplinary approach to management is likely to help most.
- This approach requires integrated outpatient and inpatient programs, which are difficult to implement in the current health care financing system.
- Multidisciplinary pain management centres represent a major resource for the assessment/treatment of patients with complex and disabling pain, the training of all health professionals in this work, research into persisting pain, and public education about chronic pain and its management.
- However, most patients with chronic pain should be managed at the local community level (by different health care providers working collaboratively, as required).

Other Conclusions and Recommendations

- There is a surprising prevalence in chronic pain, even in younger adults and older adolescents.
- Education of primary health care providers and development of better tools to support effective management in the community must be supported in order to maximise the potential to intervene with this problem.
- Recognition of the adverse outcomes associated with chronic pain may lead to research and improvement of surgical or anaesthetic techniques with the potential to avoid or alleviate chronic pain and its attendant limitations.
- Research indicates that interventions that target working with appropriate pain management, together with other support such as job flexibility, could significantly reduce lost productivity costs due to chronic pain.
- Early assessment and intervention should be encouraged, particularly where chronic pain is limiting the ability of people to return to work. This process could be facilitated through awareness and education of both people with chronic pain and society as a whole (eg. medical practitioners, employers and carers). In the workplace context, these strategies are needed to counter workplace misperceptions and discrimination against people with chronic pain (eg. regarding invisible symptoms, or where the cause of chronic pain is not known). This should help induce cultural change among employers and employees to identify and implement positive long term solutions.
- Adequate ongoing funding injections are required to increase services to the informal carers of people with chronic pain, in particular for education, peer support and respite.
- Given the link between chronic pain and lower socioeconomic status, attention needs to be paid to disadvantaged groups, in particular people in rural and regional Australia, people from culturally and linguistically diverse backgrounds, and older people.

Access Economics
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1. INTRODUCTION

1.1 OVERVIEW

Access Economics was commissioned by the MBF Foundation in collaboration with the University of Sydney Pain Management Research Institute to estimate the economic impact of chronic pain in Australia in 2007.

Chronic pain is defined as pain experienced every day for three months or more in the previous six months.

The report covers the following:

- the prevalence of chronic pain in Australia by age, gender, severity and major cause in 2007, and future projections by decade to the year 2050;
- the direct health system costs of chronic pain in Australia, disaggregated by cost components (hospital, medical, pharmaceutical, diagnostics, residential aged care, allied health, research, other) for the year 2007;
- the indirect costs of chronic pain in Australia, disaggregated by cost components (productivity losses, informal care costs and the deadweight losses (DWLs) associated with transfer payments) for the year 2007;
- the burden of disease (BoD) of chronic pain in Australia, measured in terms of disability adjusted life years (DALYs), disaggregated by years of life lost due to premature death (YLL) and healthy years of life lost due to disability (YLD), and converted into a reasonable monetary equivalent; and
- a final chapter summarising cost effective interventions and drawing together strategic implications for policy development.

Specific methodologies relevant to each section are presented in the various chapters. The remainder of this chapter covers methodological issues common across the report.

1.2 CROSS-CUTTING METHODOLOGICAL ISSUES

1.2.1 Incidence and Prevalence Approaches

This report utilises the prevalence (annual costs) approach to estimating the costs of chronic pain, as the data sources generally lend themselves to utilisation of such an approach, and as this avoids the uncertainty surrounding estimates of future treatment costs associated with the alternative incidence (lifetime costs) approach. The difference between incidence and prevalence approaches is illustrated in Figure 1-1, which considers three different cases:

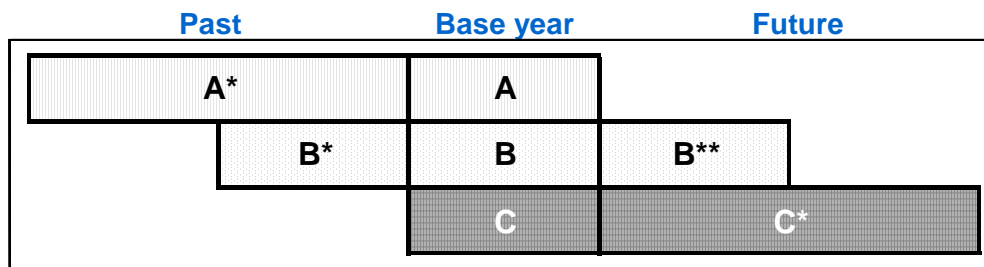
- *a*, whose onset of chronic pain was in the past and who has incurred the associated costs up to the year in question, with associated lifetime costs of $A + A^*$;
- *b*, whose onset of chronic pain was in the past and who has incurred the associated costs in 2007 as well as in the past and future, with associated lifetime costs of $B + B^* + B^{**}$; and
- *c*, whose onset of chronic pain occurred in 2007, with lifetime costs of $C + C^*$.

All costs are expressed as present values relative to 2007.

Using an **incidence** approach, only cases like 'c' would be included, with the total cost estimate equivalent to the sum of all the costs in the base year (ΣC) plus the present value of all the future costs (ΣC^*).

Using a **prevalence** approach, costs in 2007 relating to a, b and c would all be included, with total costs equal to $\Sigma(A + B + C)$. Costs in all other years are excluded.

Figure 1-1: Incidence and Prevalence Approaches to Measurement of Annual Costs



Annual prevalence costs in the base year = $\Sigma(A + B + C)$;

Annual incidence costs in the base year = $\Sigma(C + \text{present value of } C^*)$

Note that Figure 1-1 also defines the lifetime costs of chronic pain for each person, as follows.

Lifetime cost for person c (= Incidence cost) = $C + \text{present value of } C^*$

Lifetime cost for person b = $B + \text{present values of } B^* \text{ and } B^{}$**

Lifetime cost for person a = $A + \text{present value of } A^*$

1.2.2 Attributable Fractions

This report reviews the main conditions that cause chronic pain. It then estimates Attributable Fractions (AFs) for the proportion of cases under each condition where the person experiences chronic pain due to that condition. AFs are the proportion of a health condition (eg. its prevalence, mortality, disease burden or dollar costs) that is caused by – or aetiologically attributable to – a particular risk factor, after controlling for other potentially confounding factors. AFs are useful in understanding the extent to which the prevalence – and hence costs – of various conditions can be attributed to their risk factors, such as chronic pain.

For example, if 50% of people who have musculoskeletal diseases have chronic pain due to the musculoskeletal disease in a given year, then 50% of the cost of musculoskeletal diseases can be attributed to chronic pain. Repeating this calculation for the other causes of chronic pain could provide an estimate of the total health system costs, which could then be adjusted for changes in prevalence and health inflation to provide an estimate of health expenditures due to chronic pain for the year 2007.

However, even the best estimates used for the AF of chronic pain contain an amount of uncertainty. Other explanatory factors may have been inadequately controlled in source studies or may be associated with chronic pain, such as occupational factors (including injury), lifestyle, age and gender. Statistical problems in regression analysis (such as

multicollinearity) may be encountered, reflecting the complex inter-relationships between pain and other factors.

1.2.3 Classification of Costs

Conceptual issues relating to the classification of costs include the following.

- **Direct and indirect costs:** Although literature often distinguishes between direct and indirect costs, the usefulness of this distinction is dubious, as the specific costs included in each category vary between different studies, making comparisons of results somewhat difficult. This report thus distinguishes instead between the health system expenditures, other financial expenditures and loss of wellbeing.
- **Real and transfer costs:** ‘Real costs use up real resources, such as capital or labour, or reduce the economy’s overall capacity to produce (or consume) goods and services. Transfer payments involve payments from one economic agent to another that do not use up real resources. For example, if a person loses their job, as well as the real production lost there is also less income taxation, where the latter is a transfer from an individual to the government. This important economic distinction is crucial in avoiding double-counting. It has attracted some attention in the literature’ (Laing and Bobic, 2002:16).
- **Economic and non economic costs:** Economic costs encompass loss of goods and services that have a price in the market or that could be assigned an approximate price by an informed observer. ‘Non-economic’ costs include the loss of wellbeing of the individual as well as of their family members and carers. This classification is ill-defined, since ‘non-economic’ costs are often ascribed values and the available methodologies are becoming more sophisticated and widely accepted. This report acknowledges that greater controversy and uncertainty still surround the valuation of ‘non-economic’ costs and thus the dollar estimates for the loss of wellbeing are presented separately.
- **Prevention and case costs:** It is important to distinguish between the costs following from and associated with a condition and costs directed towards *preventing* that condition. Prevention activities include public awareness and education about chronic pain.

There are three types of costs associated with chronic pain and its downstream impacts.

- 1 **Direct financial costs to the Australian health system** include the costs of running hospitals and nursing homes (buildings, care, consumables), GP and specialist services reimbursed through Medicare and private funds, the cost of pharmaceuticals (Pharmaceutical Benefits Scheme and private) and of over-the-counter medications, allied health services, research and ‘other’ direct costs (such as health administration).
- 2 **Other financial costs**, which comprise the following.
 - **Productivity costs** include productivity losses of people with chronic pain such as long term employment impacts, absenteeism and/or premature mortality.
 - **Carer costs** include the value of care services provided in the community primarily by informal carers and not captured in health system costs.
 - **Transfer costs** comprise the DWL associated with government transfers such as taxation revenue forgone, welfare and disability payments.
 - **Other costs** include government and non-government expenditure on aids, equipment and modifications that are required to help cope with illness, transport and accommodation costs associated with receiving treatment, programs such as

respite and community palliative care and the bring-forward component of funerals.

- 3 **Non-financial costs** are also very important—the disability, loss of wellbeing and premature death that result from chronic pain and its impacts. Although more difficult to measure, these can be analysed in terms of the years of healthy life lost, both quantitatively and qualitatively, known as the BoD.

Different costs of diseases are borne by different individuals or sectors of society. Clearly the individual suffering chronic pain bears costs, but so do employers, government, friends and family, co-workers, charities, community groups and other members of society.

It is important to understand how the costs are shared in order to make informed decisions regarding interventions. While the person with chronic pain will usually be the most severely affected party, other family members and society (more broadly) also face costs as a result of chronic pain. From the employer's perspective, depending on the impact of chronic pain, work loss or absenteeism may lead to costs such as higher wages (ie, accessing skilled replacement short term labour) or alternatively lost production, idle assets and other non-wage costs. Employers might also face costs such as rehiring, retraining and workers' compensation.

While it may be convenient to think of these costs as being purely borne by the employer, in reality they may eventually be passed on to end consumers in the form of higher prices for goods and services. Similarly, for the costs associated with the health system and community services, although the Federal and State/Territory governments meet a large component of this cost, taxpayers (society) are the ultimate source of funds. However, for the purpose of this analysis, a 'who writes the cheque' approach is adopted, falling short of delving into second round or longer term dynamic impacts.

Society bears both the resource cost of providing services to people with chronic pain, and also the 'deadweight' losses (or reduced economic efficiency) associated with the need to raise additional taxation to fund the provision of services and income support.

Typically the groups who bear costs and pay or receive transfer payments are:

- people with chronic pain;
 - friends and family (including informal carers);
 - employers;
 - Federal Government;
 - state and local governments; and
 - the rest of society (non-government, ie, not-for-profit organisations, workers' compensation groups etc).
- } the household

Classifying costs by type and allocating them by who bears the costs enables a framework for analysis (Table 1-1).

Table 1-1: Schema for Cost Classification

Conceptual group	Subgroups	Bearer of Cost	Comments
1. Health System Costs	Costs by type of service (and prevalence in 2001)	People with chronic pain*, governments and society	
2. Other Financial Costs			
Productivity Costs	Lost productivity from temporary absenteeism	People with chronic pain, employer and governments#	
	Lost management productivity	Employers and governments#	
	Long term lower employment rates	People with chronic pain and governments#	Includes premature retirement
	Premature death	People with chronic pain and governments#	Loss of productive capacity
	Additional search and hiring replacement	Employers	Incurred when prematurely leave job
Carer Costs	Lost carer productivity	Friends and family, and employers#	Includes both paid and unpaid work
Transfer Costs	DWL	Society	Relate to transfers from taxation, welfare etc
Other Costs	Various, as able to be measured, but tend to be relatively small	Governments, people with chronic pain, Friends and family and society,	Aids, modifications, travel, accommodation, respite/ palliative care, funeral costs etc
3. Non-financial (loss of wellbeing)	BoD (YLLs, YLDs, DALYs).	People with chronic pain*	The net value of BoD should exclude other costs borne by the individual to avoid double counting

* Friends/family may also bear loss of wellbeing, health costs and lower living standards as a result of chronic pain; however, care is needed to assess the extent to which these are measurable, additional (to avoid double counting) and not follow-on impacts. For example, a spouse may pay a medical bill and children may share in lower household income when the chronic pain sufferer's work hours are reduced – but as this is simply redistribution within family income it is not measured here. Moreover, if a family carer develops depression or a musculoskeletal disorder, it would be necessary to estimate the aetiological fraction attributable to chronic pain, allowing for other possible contributing factors.

Where earnings are lost, so is taxation revenue and frequently also there are other transfers, such as welfare payments for disability/sickness/caring etc, so Governments share the burden.

1.2.4 Calculating Parameters

There are essentially two ways of estimating each type of cost:

- **top-down:** providing the total costs of a program element (eg. health system); or
- **bottom-up:** providing estimates of the number of cases in the category ('n') and the average cost for that category. The product is the total cost (eg. the wage rate for lost earnings multiplied by the average number of days off, and the number of people to whom this applies).

It is generally more desirable to use top-down national datasets in order to derive national cost estimates, to ensure that the whole is not greater or less than the sum of the parts. On the other hand, it is often difficult to obtain top-down estimates. In this report, the top-down approach is applicable to health system and BoD costs and the bottom-up approach applies in other cases.

- Data on health system costs and BoD are derived from the Australian Institute of Health and Welfare (AIHW), which in turn are based on other data sources, such as the Australian Hospital Statistics and Bettering the Evaluation and Care of Health data for GP costs.
- Data on other financial costs are drawn from a variety of sources – for example, the literature (focussing on Australian literature but sometimes supplemented by international material), data from the Australian Bureau of Statistics (ABS) Survey of Disability, Ageing and Carers (SDAC) and Average Weekly Earnings (AWE), and so on.

The main limitations of the data are in relation to timeliness, comparability and objectivity.

- Health cost data were most recently calculated by the AIHW for 2000-01 (AIHW, 2005) but only include 87.5% of recurrent costs, and so are factored up in this report and extrapolated to 2007.
- The National Health Survey (NHS) and SDAC use self-reported data on adults, where there is no medical verification of chronic pain or its impacts.
- There were differences in data collections in relation to different diseases and conditions causing chronic pain, as well as difficulty in apportioning a direct cause to a significant portion of chronic pain.
- Because chronic pain results from a range of underlying conditions (such as injuries and musculoskeletal diseases), it was difficult to find comprehensive data. Instead, data had to be constructed according to the cause of the chronic pain from a number of different sources and combined using AFs.

2. PREVALENCE AND EPIDEMIOLOGY

Chronic pain is a common condition that has a substantial economic impact on society due to its prevalence and its various impacts on people who suffer from it and those caring for them. The apparent relationship between chronic pain and socioeconomic disadvantage makes it an important public health concern in Australia. There is a growing emphasis on developing multidisciplinary management strategies for chronic illnesses such as chronic pain. However, there are relatively few Australian data on the prevalence of chronic pain and its impact on individuals and health services and the broader community.

2.1 DEFINITION AND GRADING¹

The International Association for the Study of Pain (IASP) have defined pain as:

“an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (IASP, 1986). Linton (2005) added that pain is “expressed in behaviour”.

The key points about this definition are:

- a) Pain is always subjective (there are no objective measures of it);
- b) Pain is an experience, with sensory and emotional aspects;
- c) The relationship between tissue damage and pain is variable, so the size of an injury can be a poor guide as to how much pain someone is in. The signals the body sends from an injury site are referred to as nociceptive signals. These signals only become experienced as pain when they reach the conscious brain, and the person interprets them as pain. That interpretation is influenced by many factors, including past experience, beliefs, and the situation; and
- d) Pain is expressed in behaviour - that is how we communicate it to others and an important effect of pain is on behaviour.

Common features associated with chronic pain are:

- i. **interference (ie, disability) in normal daily activities** (eg. work, home duties, family and sporting activities);
- ii. **high and ongoing consumption of treatments** (often a combination of medication, physiotherapy, chiropractic, injection therapies);
- iii. **side-effects of treatment** (typically due to medication, especially if on high doses and taking more than recommended or mixed with other substances, like alcohol – includes gastric problems, such as nausea and constipation; mental slowing or confusion which can affect functioning and operation of equipment or cars);

¹ This section was compiled by the members of the Expert Reference Group from the University of Sydney PMRI, much of it from a recent report (2007) prepared for IAG by Expert Reference Group member A/Professor Nicholas (PMRI) on the treatment of chronic pain. IAG provided their approval for this use of the material.

- iv. **mood disturbance** (mostly depression or adjustment problems);
- v. **sleep disturbance** (trouble getting to sleep and/or frequent waking during the night); and/or
- vi. **the effects of disuse** (eg. deconditioning of muscles/joints, loss of general fitness).

2.1.1 Chronic Pain Mechanisms

Reasons for the persistence of pain beyond the acute stage are often difficult to pinpoint and computerised tomography or magnetic resonance imaging scans are not reliable predictors of pain and disability. While some ongoing pain is due to clear nerve damage (eg. spinal cord or spinal nerve injury), in many cases no identifiable cause can account for the persistence of pain.

Current research indicates that a more likely explanation lies in the development of changes in function within the central nervous system and this may be demonstrated by the processes called central sensitisation, whereby previously non-noxious activities or stimuli come to aggravate pain and other associated symptoms.

It is also thought that, over time, interactions develop between the musculature, the nervous system and the person's psychological state, which act to perpetuate the problems experienced by those with disabling chronic pain. These explanations for chronic pain have been summarised in the biopsychosocial model of chronic pain (Section 2.1.4). This model has become widely recognised as currently the most useful perspective for both explaining and treating chronic pain. Although rarely primary causes of chronic pain, psychological and environmental factors often play a critical role in the maintenance of chronic pain and associated disability. The combination of central nervous system physiological changes, psychological and environmental changes has been described as a 'disease entity' (Siddall and Cousins, 2004). In other words, the processes of chronic pain become the principal problem.

2.1.2 Nociceptive Pain

Pain in response to tissue damage (injury) or noxious stimulation that may threaten injury is a normal event. This initial pain associated with injury (or noxious stimulation) is normally called '**nociceptive pain**' (Meskey and Bogduk, 1994; Hudspith and Siddall, 2006).

Nociceptive pain is attributed to activation of small sensory nerves in the periphery of our body. The periphery is anything outside the central nervous system (which includes the spinal cord and the brain). Nociceptive pain is usually localised to a particular area (depending on the site of injury) (Hudspith and Siddall, 2006).

Unless there is some form of ongoing stimulation, nociceptive pain usually (but not always) settles with healing. The persistence of pain beyond three months after injury may be due to identified pathology, but for many chronic pain conditions there may be no clear cause as the original injury may have healed. It is now recognised that growth factors and other pain-related chemical factors released by injury may trigger an ongoing sensitisation of pain fibres.

In the case of chronic low back pain, for example, many authorities claim that no specific basis has been found for up to 80-85% of cases (eg. Airaksinen et al, 2005; Waddell and Burton, 2005). These figures are disputed by some researchers, but it remains the case that most chronic back pain that is not due to a specific injury (with clear pathology) has no

lasting, curative treatment, and even when there is clear pathology there is often no curative treatment (Bogduk, 2004; Goucke, 2003).

Recent evidence indicates that changes in the way the nervous system (which mediates pain responses) responds to injury and persisting pain may explain a substantial proportion of chronic pain syndromes.

2.1.3 Neuropathic Pain

Neuropathic pain can be caused by nerve, spinal cord or brain damage, resulting in abnormal nervous system function, and is identified by certain signs or symptoms reported by the patient (Siddall and Cousins, 2004).

Some of the changes in nerve functions thought to explain the abnormal sensations and sensitisation found in neuropathic pain include reduced descending inhibition in the CNS (the intact CNS normally inhibits a proportion of noxious signals coming from the periphery, but if this system is impaired more signals get through to the brain and more pain and other sensations can be experienced) (Siddall and Cousins, 2004).

While the more specific features associated with neuropathic pain are not evident in all people with chronic pain following injury, similar neural mechanisms or changes at a CNS level are thought to underpin most chronic pain conditions, especially where there is no obvious, ongoing pathology.

While the physiological mechanisms involved in most non-specific chronic pain conditions are often unclear and the subject of much speculation, it is generally thought that the most likely explanation involves a combination of nociceptive and neuropathic mechanisms operating. These are likely to include functional changes that are reflected in some form of central sensitisation and changes in parts of the brain (reflecting a learned response). This has led some leading clinicians and researchers have called for chronic pain to be recognised as a **disease entity** rather than just a symptom (Siddall and Cousins, 2004; Loeser, 2004).

2.1.4 Biopsychosocial Models (Or Conceptualisations) of Chronic Pain

The failure to identify a specific cause for persisting pain should not be assumed to imply that unexplained chronic pain is imaginary or non-existent. The relationship between injury (tissue damage) and pain is often quite variable and it is influenced by a number of **personal and environmental factors** (eg. Eccleston, 2001; Flor and Hermann, 2004; Turk, 2002b). More recently, it has been found that **genetic factors** are important in the large inter-individual variations in pain response in cause-specific pain conditions (Tegeader et al, 2006; Mogil et al, 2000). This may help to explain why some individuals progress to persistent pain while others do not (Tegeader et al, 2006). Also, there are specific pain disorders with a genetic link (Nicholson et al, 1996; Ophoff et al, 1996; Dib-Hajj et al, 2005), including one which causes a congenital inability to experience pain (Cox et al, 2006). However, genetic factors alone do not account for the development of chronic pain.

Some of these personal factors are psychological and some are biological. These factors would not usually cause the initial (acute) pain but they may act to maintain or modulate it. In other words, to some extent they may be a consequence of injury and pain and they, in turn, may come to influence how much the pain affects the person and interferes with his/her life.

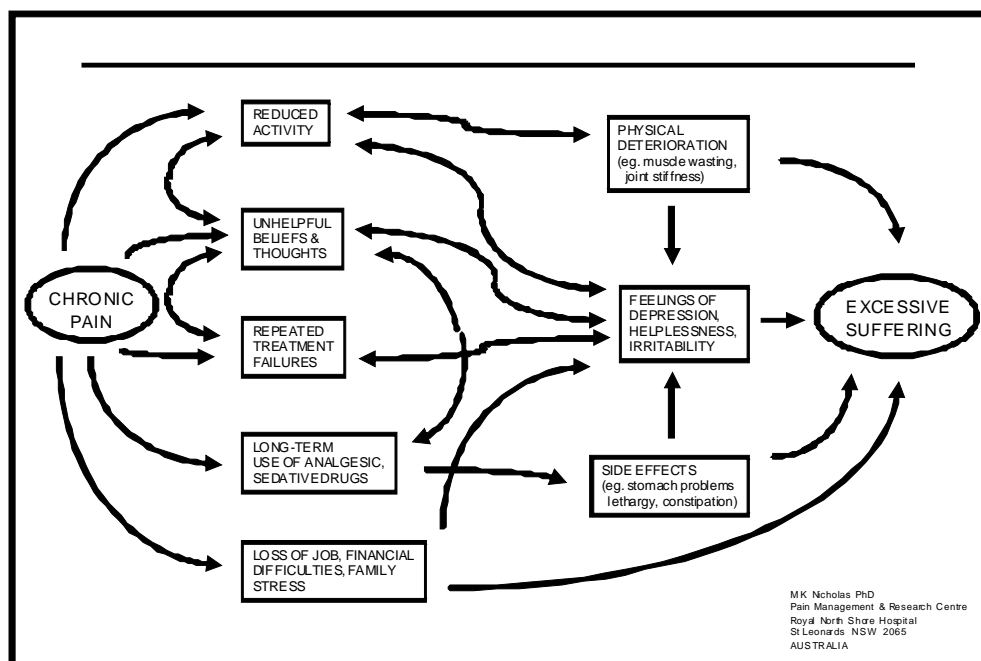
Biopsychosocial models of pain represent ways of trying to link the three main contributors (biological, psychological and environmental factors) together to make sense of pain phenomena.

Although this model has developed over time, with new findings resulting in changes to the previous concepts of chronic pain, each version shares common features (Flor and Hermann, 2004; Turk, 2002b).

The main characteristic of these models is that they attempt to account for the experience of pain and its impact in terms of an interaction between the three main factors. Thus biological changes (eg. injury) can lead to psychological effects (eg. pain) which, in turn, can affect the body through mechanisms like avoidance of activity (which may lead to deconditioning, as well as depression).

The figure below provides a summary of how persisting pain can become a greater problem than it needs to be.

Figure 2-1: How Chronic Pain Can Become a Problem



This model of pain has important implications for treatment and management. Simply stated, the model predicts that if biological, personal and/or environmental factors appear to be contributing to an emerging chronic pain condition (or syndrome), as many as possible of these facets should be addressed in any intervention to prevent the pain from becoming unnecessarily disabling. Failure to do so risks creating a major long term health problem with all its likely complications and costs (Turk, 2002b; Loeser, 1996; Linton, 2002; Main, 2002).

Because chronic pain is a subjective ongoing experience, the pain intensity, pain persistence, pain related disability and recency of onset vary across people. As a result of these differences, grading classifications have been developed to help qualitatively order pain severity. Von Korff et al (1990) proposed the measurement of chronic pain severity in three dimensions: persistence (duration), intensity and disability. This led to the development of the widely-used **Chronic Pain Grade (CPG)** (Von Korff et al, 1992), based on measures

of pain intensity and pain related disability. The CPG is a seven-item instrument that includes sub-scale scores for characteristic pain intensity, disability score and disability points. This leads to the calculation of an overall grading that enables people with chronic pain to be classified into one of four hierarchical categories according to pain severity or interference:

- Grade I**, low disability-low intensity;
- Grade II**, low disability-high intensity;
- Grade III**, high disability-moderately limiting; and
- Grade IV**, high disability-severely limiting.

The CPG has been validated by various international studies and found to be an acceptable, valid and reliable instrument for assessing the presence and severity of chronic pain (Penny et al, 1999).

2.2 PREVALENCE AND SEVERITY IN AUSTRALIA

There are relatively few data in Australia on the prevalence of chronic pain. The best method of measuring community prevalence is through well-designed representative surveys of populations, using a consistent definition of chronic pain. Two of the most representative studies of chronic pain in the general adult Australian population include the state-wide 1997 New South Wales (NSW) Health Survey and the Northern Sydney Area (NSA) Pain Study of 1998. Both surveys used the IASP definition of chronic pain as 'pain experienced every day for three months or more in the previous six months' prior to the survey being conducted.

- It should be noted that there are other Australian epidemiological studies that have focussed on specific pain sites or population groups. For example, Walker et al (2004) found that 10% of Australian adults had experienced disabling low back pain over a six month period. Helme and Gibson (2001) found that the prevalence of chronic pain was 53% in Victorians aged 65-90 years.

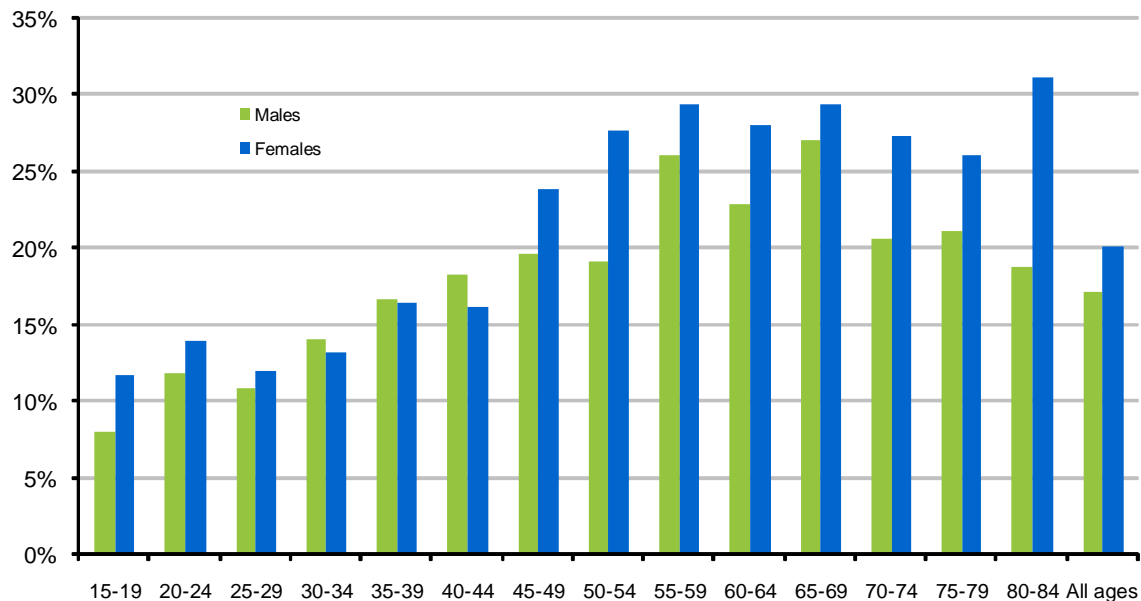
The **1997 NSW Health Survey** included a module of questions about chronic pain. This was a state-wide telephone health survey conducted by the NSW Health Department's Epidemiology and Surveillance Branch (NSW Health Department, 1999). NSW has a population of over six million people, with most living in urban areas. As a result, this is the first study that established the prevalence of chronic pain in a general sample of the Australian adult population, and one of the largest reported in the literature (Blyth et al, 2001).

The sample of the survey consisted of around 1,000 respondents from each of NSW's 17 geographically defined health administration areas (NSW Health Areas). To be eligible, respondents had to be aged 16 years and over, live in a private residence with access to a phone, and speak English or one of six other community languages (Blyth et al, 2001).

Computer-assisted telephone interviewing (CATI) was used to collect data. A two-stage stratified sample design was used, consisting of (1) simple random sampling of household telephone numbers within strata (NSW Health Areas); and (2) simple random sampling of a household resident aged 16 years and over from each selected household (NSW Health Department, 1999). Interviews were completed by 17,543 respondents with an overall response rate of 70.8% (Health Area range 63.9–79.4%). The demographic profile of the sample is comparable to that of NSW as a whole (Blyth et al, 2001).

Some 20% of females and 17.1% of males reported experiencing chronic pain (Figure 2-2). For males, prevalence peaked at 27.0% in the 65-69 year age group and was generally higher in men aged 55 to 69 years. For females, prevalence peaked at 31.0% in the oldest age group (80-84 years) and was consistently higher after the age of 50 years compared to younger age groups. Indeed, prevalence was less than 10% only in males aged 16-19 years. However, it should be noted that the oldest and youngest age groups contained relatively small numbers of respondents (Blyth et al, 2001).

Figure 2-2: Prevalence of Chronic Pain by Age and Gender (NSW Health Survey, %)



Source: Based on NSW Health Department (1999) and Blyth et al (2001).

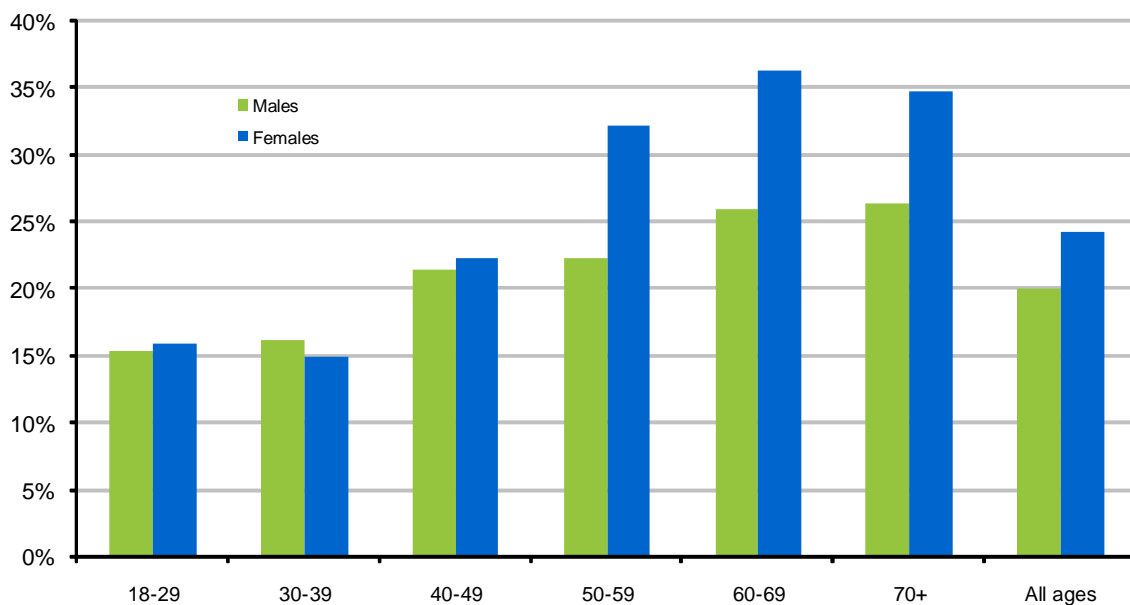
The **NSA Pain Study** of 1998 used a similar sampling method to the 1997 NSW Health Survey. Data were collected by CATI using random digit dialling methods within the NSA, an urban geographical area with a base population exceeding 700,000 (ABS, 1997).

Once contact with a household was made, participants were chosen by randomly sampling from eligible household members (18 years of age or more, and speaking English as their primary language) using CATI technology. No substitution of household members was permitted. Data collection occurred between July and September, 1998.

In addition to being consistent with the IASP definition of chronicity, in this survey chronic pain severity was also measured using the CPG outlined above. More details on the design and sample characteristics are available elsewhere (Blyth et al, 2003a).

Chronic pain was reported by 474 of the 2,092 respondents (293 women and 181 men), giving an age-and gender-adjusted prevalence of chronic pain of 22.1% - a similar (albeit slightly higher) outcome compared to the 1997 NSW Health survey data. Women had a higher prevalence than men (24.1% versus 19.9%). Prevalence was highest in the 70 years and over age group for men at 26% and the 60–69 year age group for women at 36% (Figure 2-3) (Blyth et al, 2003a).

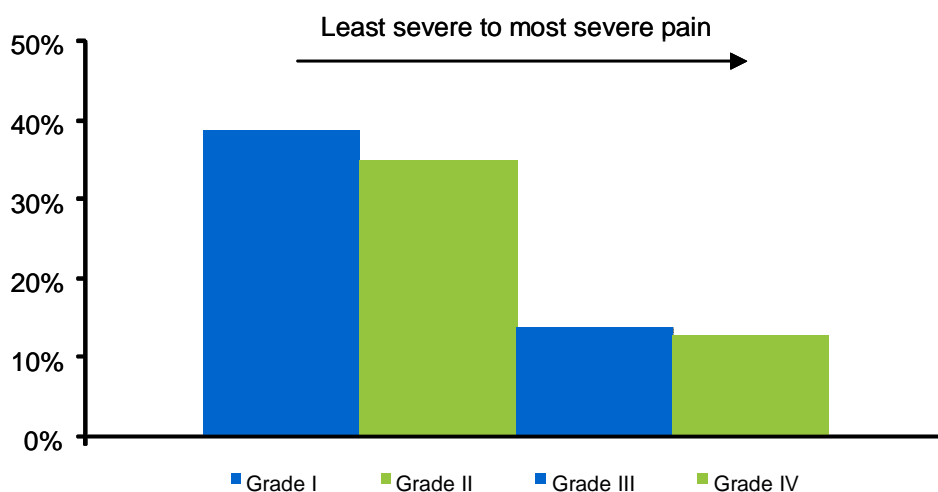
Figure 2-3: Prevalence of Chronic Pain by Age and Gender (NSA Pain Study, %)



Source: Blyth et al (2003a).

While most respondents experienced the least disabling type of chronic pain (CPG I at 39%), high levels of pain related disability (CPGs III and IV) still occurred in 27% of the respondents (Figure 2-4). Pain was most commonly experienced in the back (45% of those with chronic pain), followed by the leg (42%), shoulder (29%), arm (22%) and neck (20%), with a substantial proportion of respondents having pain in multiple sites.

Figure 2-4: Severity of Chronic Pain (%)



Source: NSA Pain Study, Blyth et al (2003a).

Most chronic pain lasted between one and ten years for both males (45.7%) and females (55.4%). However, 27.9% of respondents reported chronic pain with duration of more than

10 years, and a significant proportion of pain persisted beyond 20 years (14.9% for males and an even greater 18.2% for females).

Table 2-1: Prevalence of Chronic Pain, by Duration (%)

	Males	Females	Persons
3-6 months	9.5%	6.0%	7.5%
7-12 months	13.9%	13.2%	13.5%
1-10 years	45.7%	55.4%	51.2%
11-20 years	16.0%	7.3%	11.1%
>20 years	14.9%	18.2%	16.8%

Source: NSA Pain Study, Blyth et al (2003a).

2.2.1 Baseline Prevalence Estimates

Table 2-2 provides estimates of chronic pain (by age and gender) that are used in this report. They are based on the finding of the NSW Health Survey as this is a more representative study compared to the NSA Pain Study – having a larger sample size and including people from broader backgrounds such as individuals from rural areas and non-English speakers. Overall, the prevalence of chronic pain is higher in women (20.0%) than in men (17.1%); prevalence was higher for women in every age group except ages 35-44. Given that the NSW Health Survey does not include data on chronic pain in children, chronic pain is conservatively assumed to be zero for children aged 0-14 years.

Table 2-2: Baseline Prevalence Rates by Age and Gender (%)

Age Group	Males	Females
15-19	8.0%	11.6%
20-24	11.7%	13.8%
25-29	10.7%	11.9%
30-34	14.0%	13.1%
35-39	16.6%	16.3%
40-44	18.2%	16.1%
45-49	19.6%	23.7%
50-54	19.1%	27.6%
55-59	26.0%	29.3%
60-64	22.8%	28.0%
65-69	27.0%	29.3%
70-74	20.5%	27.2%
75-79	21.0%	26.0%
80-84	18.7%	31.0%
85-89	18.7%	20.0%
90+	18.7%	20.0%
Total	17.1%	20.0%

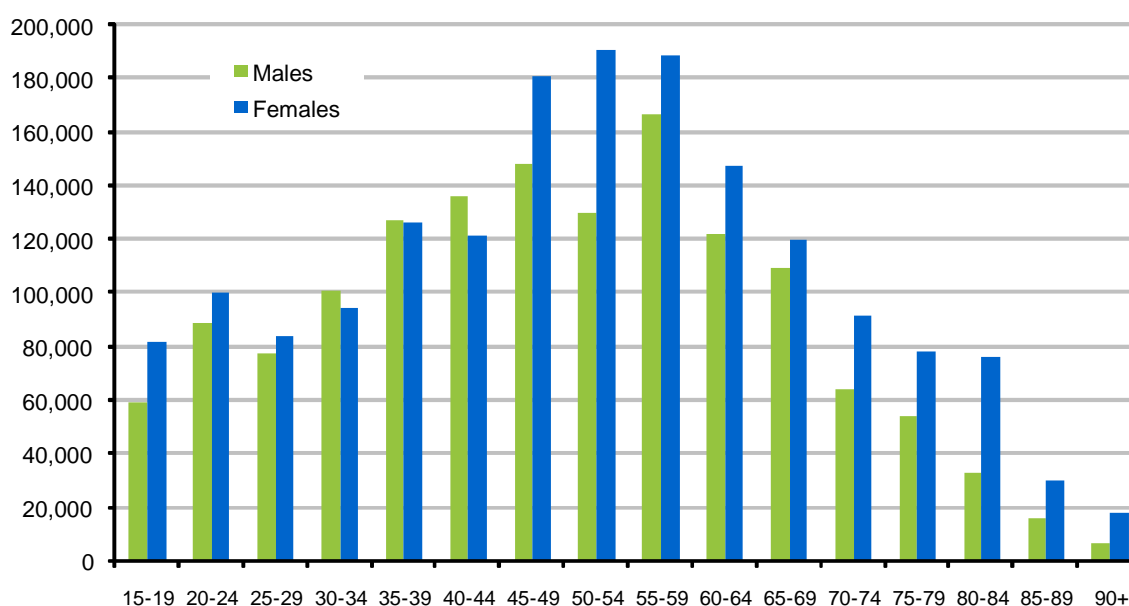
Source: Based NSW Health Department (1999) and Blyth et al (2001).

Note: 'total' percentages are relative to the population aged 15 years and older.

Figure 2-5 shows the estimated prevalence of chronic pain for 2007, calculated using the prevalence rates from Table 2-2 and figures for the Australian population for 2007 (from the Access Economics Demographic Model based on ABS demographic data).

- In 2007, around 3.2 million Australians (1.4 million males and 1.7 million females) are estimated to experience chronic pain.
- The 50-54 age group is estimated to contain the largest number of women with chronic pain (190,426), while the 55-59 age group has the highest number of men with chronic pain (166,368).

Figure 2-5: Prevalence of Chronic Pain, 2007



Source: Based on NSW Health Department (1999) and Blyth et al (2001).

2.2.2 Projections of Future Prevalence

Table 2-3 outlines the projected prevalence of chronic pain in the total population on the basis of demographic ageing only, not taking into account any changes in age-gender prevalence rates in the future.

- The **prevalence of chronic pain is projected to increase as the population ages** (from around 3.2 million Australians in 2007 to 5.0 million by 2050).
- Chronic pain is projected to increase for men from 13.9% to 15.4% and for women from 16.5% to 18.4% (noting that these proportions are relative to the population of all ages, so are lower than the totals in Table 2-2 due to the assumption of zero prevalence among children aged under 15 years).
- The female share of total chronic pain is higher, at over 54% for the projection period.

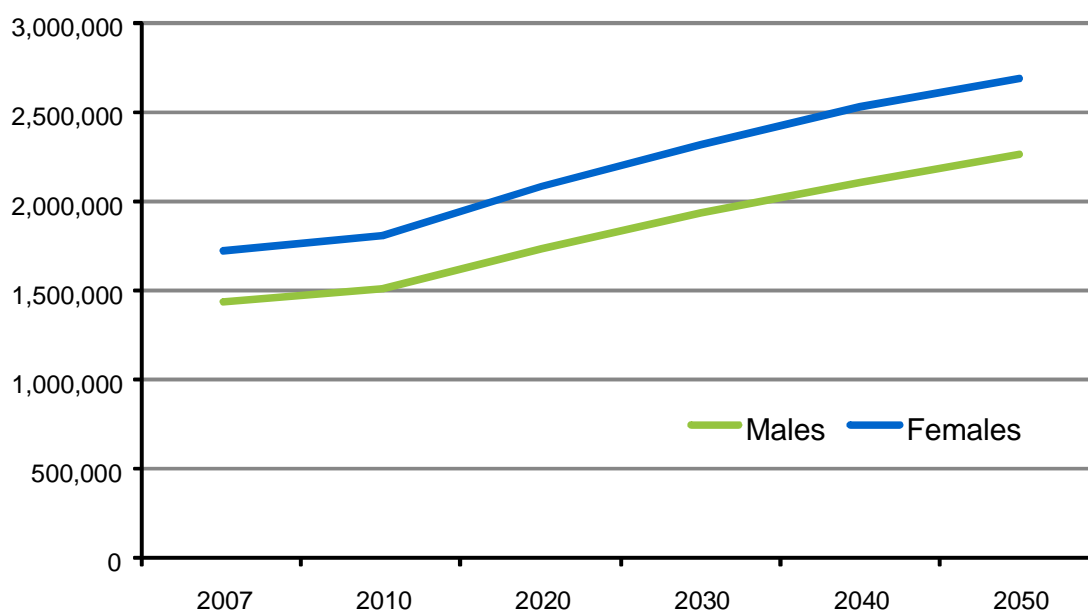
Table 2-3: Chronic Pain by Age and Gender, Projected Prevalence to 2050

	2007	2010	2020	2030	2040	2050
15-19	59,135	60,694	58,337	58,750	63,026	63,749
20-29	165,598	174,705	187,250	182,896	187,405	197,372
30-39	227,887	228,407	256,802	275,429	269,466	275,263
40-49	284,048	286,460	292,873	328,972	351,722	345,012
50-59	296,402	308,163	340,888	350,283	391,958	421,430
60-69	231,406	261,527	325,652	362,144	374,851	423,475
70+	172,216	187,400	276,177	381,882	474,230	541,801
Total males	1,436,693	1,507,357	1,737,977	1,940,356	2,112,658	2,268,103
% of males	13.9%	14.1%	14.4%	14.9%	15.2%	15.4%
% of total prevalence	45.4%	45.4%	45.5%	45.5%	45.5%	45.8%
15-19	81,826	83,667	80,296	80,809	86,666	87,632
20-29	183,686	193,882	206,924	201,706	206,626	217,310
30-39	220,931	219,318	241,395	258,103	251,846	256,826
40-49	302,168	304,438	307,196	335,723	359,543	351,123
50-59	379,081	397,263	432,867	436,310	482,008	513,584
60-69	267,628	304,791	389,871	426,593	431,649	478,570
70+	292,980	310,153	423,538	583,422	709,987	783,040
Total females	1,728,300	1,813,512	2,082,086	2,322,666	2,528,326	2,688,085
% of females	16.5%	16.8%	17.3%	17.8%	18.2%	18.4%
% of total prevalence	54.6%	54.6%	54.5%	54.5%	54.5%	54.2%
15-19	140,961	144,361	138,633	139,559	149,692	151,382
20-29	349,284	368,588	394,173	384,602	394,031	414,682
30-39	448,818	447,726	498,196	533,532	521,312	532,089
40-49	586,217	590,899	600,069	664,695	711,266	696,135
50-59	675,483	705,426	773,755	786,593	873,966	935,013
60-69	499,034	566,318	715,522	788,737	806,499	902,045
70+	465,196	497,553	699,715	965,304	1,184,217	1,324,841
Total persons	3,164,993	3,320,870	3,820,064	4,263,023	4,640,983	4,956,187
% of persons	15.2%	15.4%	16.1%	16.4%	16.7%	16.9%

Source: Based on NSW Health Department (1999) and Blyth et al (2001).
 Note: 'total' percentages are relative to the Australian population (all ages).
 The above results exclude children (aged 0-14).

Table 2-3 further highlights the projected growth in chronic pain prevalence from 15.2% of the population in 2007 to 16.9% by 2050.

- By 2050, around 2.7 million females are projected to experience chronic pain compared to 2.3 million males (Figure 2-6).

Figure 2-6: Projected Prevalence of Chronic Pain by Gender

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

Note that the 'kink' in the chart reflects that the first period is three years while other periods are a decade.

Projected chronic pain severity is reported in Table 2-4. Again this only looks at the effect of demographic ageing on the severity of chronic pain, and excludes any treatments or interventions that might affect chronic pain severity.

- Most people with chronic pain are projected to be categorised under the least disabling type of chronic pain (either Grade I with around 1.9 million people by 2050 and Grade II with 1.7 million people).
- High levels of pain related disability (CPGs III and IV) still occurred in 27% of the respondents or around 1.3 million people by 2050.

Table 2-4: Chronic Pain by Severity, Projected Prevalence to 2050

	2007	2010	2020	2030	2040	2050
Grade I	1,218,522	1,278,535	1,470,725	1,641,264	1,786,779	1,908,132
Grade II	1,091,922	1,145,700	1,317,922	1,470,743	1,601,139	1,709,885
Grade III	443,099	464,922	534,809	596,823	649,738	693,866
Grade IV	411,449	431,713	496,608	554,193	603,328	644,304
Total persons	3,164,993	3,320,870	3,820,064	4,263,023	4,640,983	4,956,187

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

Table 2-5 outlines projections of chronic pain duration to 2050, highlighting that pain with duration of one to ten years is the most common, and increasing from around 1.6 million in 2007 to 2.5 million in 2050.

- A substantial number of individuals are projected to experience chronic pain for a period of more than 20 years (around 0.5 million in 2007, rising to around 0.8 million by 2050 with population ageing).

Table 2-5: Chronic Pain by Duration, Projected Prevalence to 2050

	2007	2010	2020	2030	2040	2050
Males						
3-6 months	136,486	143,199	165,108	184,334	200,702	215,470
7-12 months	199,700	209,523	241,579	269,710	293,659	315,266
1-10 years	656,568	688,862	794,256	886,743	965,485	1,036,523
11-20 years	229,871	241,177	278,076	310,457	338,025	362,896
>20 years	214,067	224,596	258,959	289,113	314,786	337,947
Females						
3-6 months	103,698	108,811	124,925	139,360	151,700	201,606
7-12 months	228,136	239,384	274,835	306,592	333,739	362,891
1-10 years	956,614	1,003,779	1,152,435	1,285,596	1,399,428	1,374,955
11-20 years	126,166	132,386	151,992	169,555	184,568	298,377
>20 years	313,686	329,152	377,899	421,564	458,891	450,254
Persons						
3-6 months	240,184	252,010	290,033	323,694	352,402	417,076
7-12 months	427,836	448,906	516,414	576,301	627,398	678,158
1-10 years	1,613,183	1,692,641	1,946,690	2,172,339	2,364,913	2,411,478
11-20 years	356,037	373,564	430,069	480,012	522,593	661,274
>20 years	527,754	553,749	636,857	710,677	773,677	788,202

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

2.3 CAUSES OF CHRONIC PAIN

There are many underlying causes of chronic pain, although it is not possible to always determine the precise cause of the pain. Chronic pain may occur due to the persistent stimulation of nociceptors in areas of ongoing tissue damage, for example, chronic pain due to osteoarthritis. Frequently, however, chronic pain persists long after the tissue damage that initially triggered its onset has resolved, and in some individuals, chronic pain can continue without ongoing tissue damage or preceding injury that can be detected with currently available diagnostic technology.

These common chronic pain syndromes include: chronic low back pain, headache, myofascial pain syndrome, fibromyalgia, neuropathic pain, phantom limb pain, central pain syndromes, arthritis, cancer, post-herpetic neuralgia, and chronic post-surgical pain. Knowledge about the underlying pathophysiology of many of these disorders is limited (Ashburn et al, 1999). The NSA Pain Study identified that chronic pain was most commonly experienced in the back (45% of those with chronic pain), followed by the leg (42%), shoulder (29%), arm (22%) and neck (20%), with some respondents having pain in multiple sites (Blyth et al, 2003a).

The NSA Pain Study further identified injury as the major cause of chronic pain, followed by a health problem (Table 2-6). The most common type of injury was sports injury (13% of people with chronic pain), which was particularly common in men with chronic pain (21%). Work-related accidents and conditions were the nominated cause in 14% of people. of those with chronic pain, 35% reported having a diagnosed cause from a doctor, most commonly arthritis (9%). When reported diagnoses were classified according to World Health Organization (WHO) ICD-10 categories, diseases of the musculoskeletal system and connective tissues (M00–M99) were most common with 26%. However, it can also be seen that a third of respondents could not identify a preceding event (injury or health problem) that had caused chronic pain (Blyth et al, 2003a).

Table 2-6: Preceding Events of Chronic Pain (NSA Pain Study)

Preceding event	Per cent
Injury	38
Sports injury	13
Work accident	4
Car accident	8
Home accident	7
Other injury	6
Health problem	29
Illness	11
Work-related (not involving an accident)	9
Other health problem	8
No clear reason	32
Don't know	1

Source: Blyth et al (2003a).

2.3.1 Risk Factors and Associations

Chronic pain particularly affects older people, females, and those with lower socioeconomic status (SES) and poorer health status. Chronic pain has the potential to have a pervasive impact on people who experience it, and may profoundly affect their mood, physical functioning and social relationships. Individuals with chronic pain can also experience depression, sleep disturbance, fatigue and reduced overall physical effectiveness. Andersson et al (1993) found that dysfunctional chronic pain was more prevalent in respondents with low SES. Von Korff et al (1990) demonstrated associations between increased levels of pain disability and unemployment, lower levels of educational attainment and lower levels of household income. However, chronic pain is a significant problem across all levels of socioeconomic status.

- The **NSW Health Survey** examined chronic pain and associated socioeconomic and other risk factors.

2.3.1.1 Age and Gender

The survey found that chronic pain was associated with age, with the average age of chronic pain respondents higher compared to respondents with no chronic pain, and a higher rate of women with chronic pain (Table 2-7). This finding has also been confirmed by the NSA Pain Study (see Section 2.2 above).

2.3.1.2 Socioeconomic Status

Chronic pain was associated with lower SES. NSW Health Survey respondents with the highest educational level (university or other post-school qualification) or with private health insurance cover were significantly less likely to have chronic pain (Table 2-7).

People with chronic pain were much more likely to be receiving a government pension or benefit compared to respondents without chronic pain, and were more than twice as likely to receive disability benefits. Respondents receiving a pension or benefit were 70% more likely to have chronic pain compared to respondents not receiving a pension or benefit.

In addition, there were strong associations between receiving a disability benefit or unemployment benefit and having chronic pain. Being unemployed due to health reasons

accounted for 7.6% of chronic pain respondents but only 1.3% of respondents without chronic pain, an almost six-fold difference.

Significantly, fewer chronic pain respondents were in full time or part time employment (30.9% people with chronic pain vs. 42.8% for individuals without chronic pain). After adjustment for age, sex and comorbidity differences, being unemployed for health reasons was still strongly associated with having chronic pain (adjusted odds ratio (OR) = 6.41), as was being unemployed per se (adjusted OR = 1.70) (Blyth et al, 2001).

Table 2-7: Demographic Characteristics by Pain Status^a

	No pain (n = 13,899) % (n)	Chronic pain ^b (n = 3598) % (n)	Adjusted Odds ratio ^c (95% CI)
Age			
Male	41.8 years	47.4 years	
Female	42.6 years	50.1 years	
Gender			
Male	43.4 (6027)	40.5 (1458)***	
Female	56.6 (7872)	59.5 (2140)***	
University or other post-school qualification	36.6 (4594)	31.0 (998)***	0.87 (0.78-0.96)**d
Private health insurance cover	43.4 (5448)	38.1 (1234)***	0.76 (0.69-0.84)***e
Receiving pension or benefit	24.7 (4166)	42.3 (1704)***	1.70 (1.53-1.90)***f
Pension or benefit type			
Disability benefit	8.3 (341)	17.4 (318)***	3.89 (3.15-4.79)***f
Unemployment benefit	11.2 (444)	9.4 (147)*	1.99 (1.57-2.52)***f
Employment status			
Employed Full-time	42.8 (5718)	30.9 (1047)***	
Employed Part-time	12.9 (1867)	11.5 (405)*	1.09 (0.92-1.28)g
Unemployed	4.2 (6100)	5.0 (205)*	1.70 (1.37-2.11)***g
Unemployed/Health reasons	1.3 (197)	7.6 (295)***	6.41 (4.97-8.28)***g

a * Significant at p=0.05%; ** Significant at p=0.01%; *** Significant at p=0.001%.

b Comparison group for significance tests is no pain.

c Mean (95% confidence interval) adjusted for sex, age and comorbidity.

d Reference group, did not complete secondary schooling.

e Reference group, no private health insurance cover.

f Reference group, not receiving a pension or benefit.

g Reference group, employed full-time.

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

2.3.1.3 Health Status

The NSW Health Survey found that individuals with chronic pain were far more likely to rate their health as poor compared to the no pain group. Of people with chronic pain where the pain caused interference with daily activities, 15.7% rated their health as poor compared with 1.4% for individuals without chronic pain (Table 2-8).

Respondents with poor self-rated health status were significantly more likely to report having chronic pain compared to those who rated their health more positively (adjusted OR = 7:24 (5.87±8.92). Within the chronic pain group, poor self-rated health was associated with a five-fold increase in the likelihood of having interference with daily activities due to chronic pain (adjusted OR = 5:01 (3.53±7.11) (Blyth et al, 2001).

Table 2-8: Self-Rated Health by Pain Status^a

	No pain % (n)	Chronic pain & no interference ^b % (n)	Chronic pain & interference ^c % (n)
Excellent	21.6 (3013)	12.5 (145)***	6.4 (144)***
Very good	39.4 (5434)	32.6 (400)***	21.0 (484)***
Good	28.2 (3868)	33.5 (427)**	29.3 (667)***
Fair	9.3 (1347)	17.4 (228)***	27.5 (659)**
Poor	1.4 (235)	4.0 (59)***	15.7 (384)***

a ** Significant at p=1%; *** Significant at p=0.1%.

b Comparison group for significance tests is no pain.

c Comparison group for significance tests is chronic pain with no interference.

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

These findings are consistent with international studies which have found that chronic pain is independently related to low self-rated health in the general population (for example, Mantyselka et al, 2003).

2.3.1.4 Psychological Distress

The NSW Health Survey found that there was a significant increase in psychological distress in both males and females reporting chronic pain which interfered with their daily activities.

The survey measured psychosocial distress using a ten-item questionnaire on the level of anxiety and depressive symptoms experienced by respondents in the preceding four weeks. For example, respondents were asked: 'In the last four weeks, how often did you feel that everything was an effort?' For each item, there is a five-point adjective scale related to the amount of time during the preceding four weeks that the respondent experienced the particular problem (from 'all of the time' to 'none of the time'). Raw scores ranging between 0 to 50 were converted to a T-score with a mean of 50 and a standard deviation of 10. Scores of 60 or more (representing one standard deviation above the mean) have been found to correspond to high levels of psychological distress using other established measures (NSW Health Department, 1999).

The survey also found that having chronic pain alone was associated with increased levels of distress for females but not for males (Table 2-9). Respondents with standardised mental health scores of 60 or more were three times more likely to report having chronic pain compared to respondents with lower scores. Within the group reporting chronic pain, having standardised mental health scores of 60 or more was significantly associated with the presence of interference with activities due to pain (Blyth et al, 2001).

Table 2-9: Standardised Mental Health Score of 60 Or More^a

	No pain	Chronic pain & no interference ^b	Chronic pain & interference ^c
	% (n)	% (n)	% (n)
Males	8.8 (511)	8.9 (46)	30.9 (284)***
Females	12.4 (967)	17.9(131)**	33.3 (472)***

a ** Significant at p=1%; *** Significant at p=0.1%.

b Comparison group for significance tests is no pain.

c Comparison group for significance tests is chronic pain with no interference.

Source: Based on NSW Health Department (1999) and Blyth et al (2001).

The findings from the NSW Health Survey on psychological distress are consistent with other research that suggests there is a link between chronic pain and mental conditions such as distress and depression (Clarke et al, 2005).

- For example, Magni et al (1993) reported that chronic musculoskeletal pain was linked to major depressive symptoms.
- Similarly, significant associations have been found between somatisation², anxiety and depression scale scores and site-specific pain conditions (Von Korff et al, 1988) across different populations.

Other studies also corroborate that there is an association between experiencing interference with daily activities due to chronic pain and increased levels of psychological distress (eg. Rudy et al, 1988).

2.3.2 Mortality

Chronic pain, especially when it has a long duration, may be associated with an increased risk of mortality. However, there are relatively few data available regarding the association between chronic pain and mortality.

- A large study of chronic widespread pain in 6,569 individuals in Northwest England over eight to nine years showed an association between reported widespread pain and mortality in cancer. The study found that 1,005 (15.3%) participants had widespread pain, 3,176 (48.3%) had regional pain, and 2,388 (36.4%) experienced no pain. During follow up, mortality was higher in people with regional chronic pain (mortality rate ratio (MRR) 1.21, 95% confidence interval 1.01 to 1.44) and widespread chronic pain (MRR 1.31, confidence interval 1.05 to 1.65) than in those who reported no pain. The excess mortality among people with regional and widespread chronic pain was largely related to deaths from cancer (MRR 1.55 (1.09 to 2.19) for regional pain and MRR of 2.07 (1.37 to 3.13) for widespread pain). There were also more deaths from causes other than disease (for example, accidents, suicide, violence) among people with widespread pain (MRR 5.21, 0.94 to 28.78). The excess cancer mortality remained after exclusion of people in whom cancer had been diagnosed before the initial survey and after adjustment for potential confounding factors. The explanations of these findings were not clear; however, the effects of stress and pain on the immune system

² Somatisation is when physical symptoms develop through stress or emotional problems. Somatisation disorder is diagnosed when a person has experienced multiple physical complaints and symptoms over a long period of time. These symptoms cannot be identified or explained through medical examinations or tests.

were suggested as possible explanations for the higher mortality (Macfarlane et al, 2001).

- A 12-year follow-up study on chronic pain in the Swedish general population found that mortality was higher in the study respondents who reported chronic widespread pain at the outset. During the 12-year period of the study, 23 out of 214 individuals died (or 10.7%): 5 from the 73 individuals without chronic pain at the start of the study (or 6.8%), 5 from the 71 individuals with neck–shoulder pain (or 7.0%) and 13 out of 70 individuals from the widespread pain group (a higher 18.6%), a significant difference between the groups. Median age at death was 72 (range 48–83) and 12 individuals out of 23 were females. Only one of the deceased individuals in the group with widespread pain had a known malignancy at the time of the initial survey. However the causes of the other deaths were not examined (Andersson, 2004).
- A cohort study of 1,361 people with chronic widespread pain in Denmark followed for an average of around five years also found excess mortality (standardised mortality ratio (SMR) 1.3; 95% CI, 0.9–1.7). Among the females, who formed most of the cohort, there was excess mortality from suicide (SMR 9.1; 95% CI, 3.3–19.8), liver disease (4.9; 95% CI 1.3–12.5) and cerebrovascular disease (SMR 3.8; 95% CI 1.4–8.2) (Macfarlane, 2005).
- Another cohort study of 1,747 people with chronic widespread pain over 25 years found an excess risk for dying (SMR 1.45; 95% CI, 1.19–1.86), using population mortality rates as a comparison. The causes of death in excess were accidental deaths (SMR 4.5; 95% CI, 2.0–10.1), infection (SMR 4.5; 95% CI, 1.7–11.9) and pneumonia (SMR 3.3; 95% CI, 1.2–8.8). Mortality was also higher in those who initially had higher levels of disability (Wolfe et al, 1999 in Macfarlane, 2005).

The research available suggests that people with chronic widespread pain may experience overall increased mortality, with the excess in the order of around 30%. However, these studies relate mainly to one type of chronic pain – chronic widespread pain – which is reported by around 10% to 13% of adults with any chronic pain (Macfarlane, 2005).

While it would be possible to attribute costs of premature mortality in this analysis, the overall view of the authors, in the interests of conservatism, is that the evidence on premature death is not strong enough to include at this stage in cost estimates, but this aspect should remain as part of a future research agenda.

2.4 EFFECT OF CHRONIC PAIN

Chronic pain imposes a large socioeconomic burden for those who suffer from it, and for society at whole. This is evident through the impact of chronic pain on work performance, on health service utilisation and on wellbeing.

2.4.1 Work Performance

Chronic pain can adversely affect work performance through absence from work due to the pain ('absenteeism') as well as affecting the ability to work effectively when at work ('presenteeism'). Absenteeism is measured by looking at the number of work days missed by people with chronic pain. Presenteeism can be estimated by multiplying the number of days worked with chronic pain by the percentage reduction in effectiveness on days worked with pain. For example, four days worked with pain with a 50% decrease in work effectiveness would result in an estimate of two reduced effectiveness work days.

The NSA Pain Study found that chronic pain had an impact on work performance, through individuals working while suffering from chronic pain. Working with pain was more common (on average 83.8 days over a six month period) than lost work days due to pain (4.5 days) among chronic pain participants in full time or part time employment. When both lost work days and reduced effectiveness work days were summed, an average of 16.4 lost work day equivalents occurred in a six month period, approximately three times the average number of lost work days (Table 2-10) (Blyth et al, 2003a). However, the standard deviation in these estimates is high.

Table 2-10: Lost Work Days and Lost Work Day Equivalents (Over a Six-Month Period)

Work impact variables	Distributional characteristics ^a	
	Mean (sd)	Median
Work days with pain	83.8 (55.0) days	80 days
Lost work days	4.5 (13.2) days	0 days
Percent reduced effectiveness	14.2% (20.5)%	3%
Reduced effectiveness days	11.9 ^b	
Lost work day equivalents	16.4 (28.4) days	3.3 days

^a Results to be interpreted with caution given high standard deviation.

^b Derived from work days with pain and percent reduced effectiveness.

Source: NSA Pain Study, Blyth et al (2003a).

Notably, a substantial proportion of individuals were able to work with pain, with 68.5% reporting more than 30 days of working with chronic pain in the previous six months. Similar results were reported for both males and females. Most participants (60% of males and 54% of females) reported some degree of reduction in their work effectiveness due to their pain. Interestingly, 38.9% of those who had worked with pain stated that they experienced no reduction in their ability to perform their work (Table 2-11). This suggests that the complete relief of chronic pain may not be an essential therapeutic target where return to work is the desired outcome (Blyth et al, 2003a).

Table 2-11: Rating of Reduced Ability to Work Due to Pain (Over a 6-Month Period)

Rating ^a	N	%
0	103	38.7
1–5	135	53.3
6–10	13	4.9
Do not know	10	3.0

^a Rating from 0 (no reduction) to 10 (unable to do any work at all); converted to percentages to estimate reduced effectiveness.

Source: NSA Pain Study, Blyth et al (2003a).

The cost to Australian employers in terms of absenteeism and reduced work effectiveness was estimated by van Leeuwen et al (2006). They found that there were 9.9 million days spent away from work due to chronic pain, equating to an estimated cost of \$1.4 billion per year. When reduced effectiveness work days were added, the total number of lost workday equivalents rose to 36.5 million, amounting to an estimated cost of \$5.1 billion per year (van Leeuwen et al, 2006).

- Males experienced a higher number of days away from work due to chronic pain and more reduced effectiveness workdays, with the total number of lost workday

equivalents estimated as 24.5 million days for males and 12.0 million for females. This may reflect greater labour force participation and greater exposure to the types of jobs with a higher incidence of work-related conditions causing chronic pain.

- The age groups 35-44 and 45-54 were the most affected among males and females, respectively (Table 2-12).

It should be noted that the estimation focussed specifically on work absence and reduction in work effectiveness due to chronic pain. It did not include other costs such as those attributed to administering sick leave or workers compensation claims, workplace modifications or treatment costs.

Table 2-12: Annual Number and Cost of Lost Workday Equivalents Due to Chronic Pain in Australia

Age	Number of days absent due to chronic pain (million)	Number of lost workday equivalents due to chronic pain (million) ^a	Cost of days absent due to chronic pain ^b (\$A millions)	Cost of lost workday equivalents due to chronic pain ^{a,b} (\$A millions)
Males				
20-24	0.5	2.0	77.9 (76.6-79.1)	291.7 (287.0-296.2)
25-34	1.4	5.1	197.3 (194.1-200.3)	738.7 (726.9-750.1)
35-44	1.9	7.2	277.6 (273.2-281.9)	1,039.8 (1,023.2-1,055.8)
45-54	1.7	6.5	249.8 (245.8-253.7)	935.5 (920.6-949.9)
55-64	1.0	3.6	137.7 (135.5-139.8)	515.6 (507.3-523.5)
Subtotal	6.5	24.5	940.3 (925.3-954.8)	3,521.2 (3,456.1-3,575.5)
Females				
20-24	0.4	1.3	46.7 (45.8-47.7)	168.7 (165.5-172.1)
25-34	0.6	2.3	85.0 (83.4-86.7)	307.0 (301.0-313.0)
35-44	0.9	3.2	115.5 (113.2-117.8)	416.9 (408.8-425.1)
45-54	1.1	3.9	142.0 (139.2-144.8)	512.5 (502.5-522.6)
55-64	0.4	1.3	47.9 (47.0-48.9)	173.0 (169.6-176.4)
Subtotal	3.3	12.0	437.2 (428.7-445.8)	1578.1 (1547.4-1609.2)
Total	9.9	36.5	1,377.4 (1,353.9-1,400.6)	5,099.2 (5,012.4-5,184.7)

^a Lost workday equivalents = days absent + reduced-effectiveness workdays.

^b 95% Confidence Interval (CI) presented in brackets.

Source: Van Leeuwen et al, (2006).

The implications are that, while the extent of the impact of reduced work effectiveness on days worked with pain on productivity is uncertain due to the large standard deviation, it has the potential to account for a large part of lost productivity costs associated with chronic pain. Further, interventions that target working despite pain, together with other support such as job flexibility, could significantly reduce lost productivity costs due to chronic pain (Van Leeuwen et al, 2006).

2.4.2 Litigation

Chronic pain has also been associated with increased litigation, mainly work related.

The NSA Pain Study found that 8.7% of people with chronic pain identified that their pain problem had been the subject of a claim for damages or a legal case. Males were twice as likely to report involvement in litigation compared with females (12.0% versus 6.2%).

- Workers compensation claims were the most common type of legal claim (51.4%), followed by accident compensation claims (24.2%). Males were more likely to report workers compensation claims (55.0%) compared to females (46.1%). In contrast, females were more likely to be involved in third party accident compensation claims.
- There was an association between litigation and poor pain outcomes. Litigants with chronic pain were usually more disabled, utilised more health services, home help and medication than non-litigants with chronic pain (Blyth et al, 2003b).

Molloy et al (1999) reported that between 1991-92 and 1995-96, pain related legal payments in NSW increased three times to \$120 million. In 1995-96, pain related claims comprised 12.6% of legal payments for back injury, 7.6% of payments for medical treatment, and 3% of payments for physiotherapy and chiropractic treatment.

- This may suggest that early assessment and intervention should be encouraged where reports of pain are limiting the ability of sufferers to return to work. This could help avoid unnecessary suffering, increasing disability, and associated legal and other costs (Molloy et al, 1999).

2.4.3 Use of Health Care

Chronic pain is generally associated with higher consumption of health care services. There are several reasons for this, including the significant global impact of chronic pain on every day functioning and quality of life, and repeated treatment that may result in the use of monotherapies of limited value.

- International population-based studies in Denmark, Sweden, and Germany, pain severity (measured variously by pain intensity, number of pain sites and the CPG) was positively correlated with health care use (Eriksen et al, 2004, Andersson et al, 1999; Chrubasik et al, 1998).

The NSW Health Survey examined whether having chronic pain and higher levels of pain related disability would be associated with greater use of health services. Health care was assessed across primary care, emergency departments and hospital admissions. The survey found that individuals with chronic pain were more likely to access health services and also more likely to be frequent users when accessing health services (NSW Health Department, 1999). The results are presented in detail in Table 2-13.

Table 2-13: Adjusted Average Overall Health Service Use, by Chronic Pain Status^a

Health service use category	Chronic pain status	N	Mean ^b (SD)	Range
Overnight hospital admissions last 12 months	No chronic pain	13,897	0.18 (0.01)	0–23
	Chronic pain—no interference	1,259	0.19 (0.02)	0–14
	Chronic pain—little /moderate interference	1,061	0.22 (0.03)	0–7
	Chronic pain—lots /extreme interference	1,272	0.46 ^c (0.04)	0–20
Emergency department (ED) visits last 12 months	No chronic pain	13,898	0.17 (0.01)	0–60
	Chronic pain—no interference	1,260	0.20 (0.02)	0–10
	Chronic pain—little /moderate interference	1,061	0.25 (0.03)	0–9
	Chronic pain—lots /extreme interference	1,270	0.85 ^d (0.30)	0–150
GP visits last 12 months	No chronic pain	13,882	4.81 (0.08)	0–156
	Chronic pain—no interference	1,260	5.69(0.23)	0–200
	Chronic pain—little /moderate interference	1,060	6.88 (0.30)	0–104
	Chronic pain—lots /extreme interference	1,264	10.72 ^c (0.52)	0–156
GP visits last 2 weeks	No chronic pain	12,042	0.40 (0.01)	0–15
	Chronic pain—no interference	1,149	0.40 (0.03)	0–12
	Chronic pain—little /moderate interference	1,004	0.45(0.04)	0–14
	Chronic pain—lots /extreme interference	1,210	0.59 ^e (0.04)	0–15

a Results should be interpreted with caution given high standard deviation. Interference refers to interference with daily activities.

b Adjusted for age, gender, self-rated health, distress, comorbidity.

c Significant at p =5% compared with pain—little /moderate interference group .

d Significant at p =5% compared with pain—little /moderate interference group or the pain—no interference group .

e Significant at p =5% compared with the pain—no interference group .

Note: Data relates to overall use of healthcare, and not just healthcare use related to chronic pain.

Source: Based on NSW Health Department (1999) and Blyth et al (2006).

The average number of visits or admissions was higher for individuals experiencing chronic pain (with or without interference with daily activities) and rose with increasing levels of interference with daily activities due to chronic pain.

- Compared to the respondents with no pain, the adjusted average number of visits or admissions was between one and a half and five times higher in the group with most pain related disability.
- Compared to chronic pain respondents with no or limited pain related disability, those with most pain related disability reported more: primary care visits in the last two weeks and last 12 months (adjusted average number of visits 0.59 vs 0.40 and 10.72 vs 4.81); hospital admissions (0.46 vs 0.18); and emergency department visits (0.85 vs 0.17).

Experiencing chronic pain alone, or having chronic pain with any level of activity interference predicted more health care use (after adjusting for age, gender, self-rated health, psychological distress, comorbidity and access to care). Higher levels of pain related disability predicted health care use more than other pain status variables. There was a strong association between pain related disability and greater use of services (Blyth et al, 2004).

2.5 MANAGING CHRONIC PAIN

It is important to recognise that as new evidence emerges, the role of different treatments can change. Nevertheless, there are key principles that should underpin strategic directions for the organisation and delivery of effective chronic pain management services, as follows.

- Persistent pain usually follows on from an acute phase. Efforts to prevent progression from acute to chronic pain are most likely to reduce the disability and economic costs

associated with chronic pain. Assessment is critical as soon as someone is not back to normal functioning as expected after initial treatment.

- Timely multi-dimensional assessment, management, and triage in primary care settings with early referral for multi-disciplinary pain assessment (if required) is needed.
- The emphasis is on coordinated, multi-disciplinary/dimensional care: in many cases, no single treatment is likely to be enough. If more than one treatment provider is involved, a coordinated (and consistent) treatment plan is essential.
- For those people with chronic, disabling pain the best evidence available (and broad consensus by experts in the field) is that a collaborative and multidisciplinary approach to management is likely to help most.
- There is wide variability in pain clinics, according to resources, staffing and types of services offered. As a result it is suggested that a term like 'multidisciplinary pain clinic' (MPC) may be preferred as it conveys a sense of multiple services.
- Multidisciplinary pain management centres represent a major resource for the assessment/treatment of patients with complex and disabling pain, the training of all health professionals in this work, research into persisting pain, and public education about chronic pain and its management.
- However, most patients with chronic pain should be managed at the local community level (by different health care providers working collaboratively, as required).
- As chronic pain is a chronic illness, provision must be made for ongoing maintenance of functional gains. Long-term management of patients assessed in MPCs will involve coordination with primary practitioners.
- Pain relief must not be the only goal. Treatments need to address functional goals and obstacles to progress. Simply addressing pain severity alone is unlikely to be sufficient in promoting functional goals.
- Appropriate training and education of all health care providers involved in assessing and treating the broad range of problems experienced by those with chronic pain is required.
- Substantial increases in funding are required for research on chronic pain and evaluation of treatments.
- As chronic pain following injury often cannot currently be cured in substantial numbers of people, treatments in such cases are typically aimed at minimising the symptoms and enabling the patient to regain (and maintain) as much normal activity as possible.
- Accordingly, in order to be maximally effective, such treatment (or treatment planning) must identify and target as many of the factors contributing to the ongoing pain, disability and barriers for successful return to functioning as possible.
- Recent major advances in basic research have identified key components of the nervous system changes associated with chronic pain. This has already resulted in some experimental drugs that will target the 'disease process' rather than the symptomatic treatment of pain (refs 34,35,14a). This raises the future possibility of curative treatment for at least some chronic pain conditions.

As the available evidence on cost effectiveness is sparse (see next section), a brief overview of the current state of knowledge about effective interventions for chronic pain is necessary, to demonstrate the range of treatments available, and to highlight the comparatively small empirical base of cost effectiveness information.

2.5.1 What Works: Current Evidence for Management of Chronic Pain

It should be acknowledged that there are not multiple (or any in some cases) randomised controlled trials on every treatment or combination of treatments for every type of chronic pain. Research into chronic pain treatments and their implementation has been limited. However, it is possible to draw some conclusions from available evidence and experience. In all cases the characteristics of people being treated must be considered to avoid generalising from some very selected samples to all patients with chronic pain.

The current evidence for common pain treatments is summarised in Appendix 1. This does not apply to the treatment of specific conditions, such as cancer or arthritis, but rather where the pain has been present daily for more than three months since onset and the focus of treatments is the relief or control of pain as well as limiting its impact on the person's functional activities (reducing disability).

The implications of this evidence are summarised below.

1. Treatment should be supported by evidence (in the literature) for effects in relevant areas (eg. pain, function, mood).
2. Given that more than one treatment is likely to be needed for many patients (eg. spinal cord stimulation plus pain program), they should be complementary. If one treatment is aimed at pain relief as a sole outcome while the others are aimed at functional gains there may be a conflict for the patient. Treatment providers should consider how possible conflicts will be overcome or avoided (simply expecting function to improve with pain reduction is unlikely to be enough if the person is fearful of pain or re-injury).
3. If there is more than one treatment provider, agreement on a coordinated (and consistent) treatment plan is essential.
4. Chronic pain is a chronic condition, so any treatment plan must have provision for maintenance of gains (and arrangements for dealing with relapses).

In cancer patients with persistent pain, there are major differences in treatment options compared to non-cancer pain, because of limited life expectancies and clear-cut underlying causes of pain. Thus, the use of pharmacological treatments, including opioids, is frequently appropriate. In addition, some interventional treatments, such as neurolytic coeliac plexus block and spinal drug delivery are highly effective (e.g. Smith et al, 2002).

3. HEALTH EXPENDITURE

3.1 METHODOLOGY

This report reviews the main conditions that cause chronic pain as identified by the NSA Pain Study. It then estimates AFs for the proportion of cases under each condition where the person experiences chronic pain due to that condition. AFs are the proportion of a health condition (eg. its prevalence, mortality, disease burden or dollar costs) that is caused by – or aetiologically attributable to – a particular risk factor, after controlling for other potentially confounding factors. AFs are useful in understanding the extent to which the prevalence – and hence costs – of various conditions can be attributed to their risk factors or underlying conditions, in this case the proportion of chronic pain that is attributed to underlying conditions such as injury or musculoskeletal disease.

For example, if 50% of people who have musculoskeletal diseases have chronic pain due to the musculoskeletal disease in a given year, then 50% of the cost of musculoskeletal diseases can be attributed to chronic pain. Repeating this calculation for the other causes of chronic pain provides an estimate of the total health system costs, which can then be adjusted for changes in prevalence and health inflation to provide an estimate of health expenditures due to chronic pain for the year 2007.

The AIHW recurrent health expenditure data for 2000-01 were used as the basis for Access Economics' estimates for health expenditure on chronic pain in 2007. However, It is important to note that chronic pain is not an ICD-10 (International Classification of Disease, Tenth Revision) condition, so the health expenditure estimates attributed to chronic pain in this analysis are not able to be summed with the costs estimated by condition by the AIHW using the Disease Costs and Impact Study methodology, as this would result in double counting. Rather, the costs of chronic pain can be understood conceptually as a subset of the health system expenditures attributed to ICD-10 conditions.

The AIHW include only 87.5% of total recurrent health expenditure in their estimates of expenditure by disease and injury, referred to as 'allocated' health expenditure. The 'unallocated' remainder includes capital expenditures, expenditure on community health (excluding mental health), public health programs (except cancer screening), health administration and health aids and appliances. As a result, allocated health expenditure is factored up by 1/0.875 to obtain total health system costs.

The other factors contributing to the extrapolation to 2007 are demographic growth by age and gender groups (increasing prevalence of chronic pain) based on ABS data, and health cost inflation based on AIHW (2006). Health inflation measures around 3-4% per annum.

3.2 HEALTH EXPENDITURE IN 2007

Incorporating health cost inflation over the period from 2001 to 2007³ and demographic changes that have occurred over this time, Access Economics estimates that in 2007 the allocated health system expenditure associated with chronic pain is around \$6.1 billion – or \$1,930 per person with chronic pain.

³ The most recent health cost inflation release is 2005, consequently, 2005-06, and 2006-07 figures have been estimated based on the 2000-01 to 2004-05 average.

Table 3-1 outlines the allocated health system expenditure by the underlying causes of chronic pain.

- Injuries (including those caused by sports, work, vehicle and home accidents) contribute the largest share of health spending at around \$2.7 billion or 43% of the total allocated health expenditure.
- Health problems, particularly musculoskeletal diseases, contribute around \$1.4 billion.
- Finally, around \$2 billion of allocated health spending on chronic pain does not have a clear reason, reflecting the complex biopsychosocial nature of pain – as outlined in Section 2.

Table 3-1: Allocated Health System Costs For Chronic Pain, 2007

	Causes of pain (%)	Health costs, total (\$million)	Chronic pain by condition (persons)	Health costs attributable to chronic pain (\$ million)
Injury	38.0	4,990	1,202,697	2,650
Health problem	29.0	34,827	917,848	1,443
Musculoskeletal	24.1	5,763	761,430	882
Mental health/behavioural	1.1	4,652	35,415	98
Gastrointestinal	1.0	3,496	32,464	95
Neurological	0.7	3,373	20,659	53
Infection	0.6	1,522	17,708	171
Circulatory (cardiovascular)	0.7	6,813	20,659	48
Genitourinary	0.6	2,582	17,708	82
Endocrine/hormonal	0.2	1,974	5,903	8
Respiratory	0.2	4,653	5,903	6
No clear reason/don't know	33.0	36,765	1,044,448	2,016
Total	100.0	76,582	3,164,993	6,109

Source: Access Economics based on detailed causes of pain from NSA Pain Study, and health costs from AIHW (2005).

When 'unallocated' costs are included, health system expenditure rises to around \$7.0 billion (Table 3-2).

Table 3-2: Chronic Pain, Total Health Expenditure, 2007

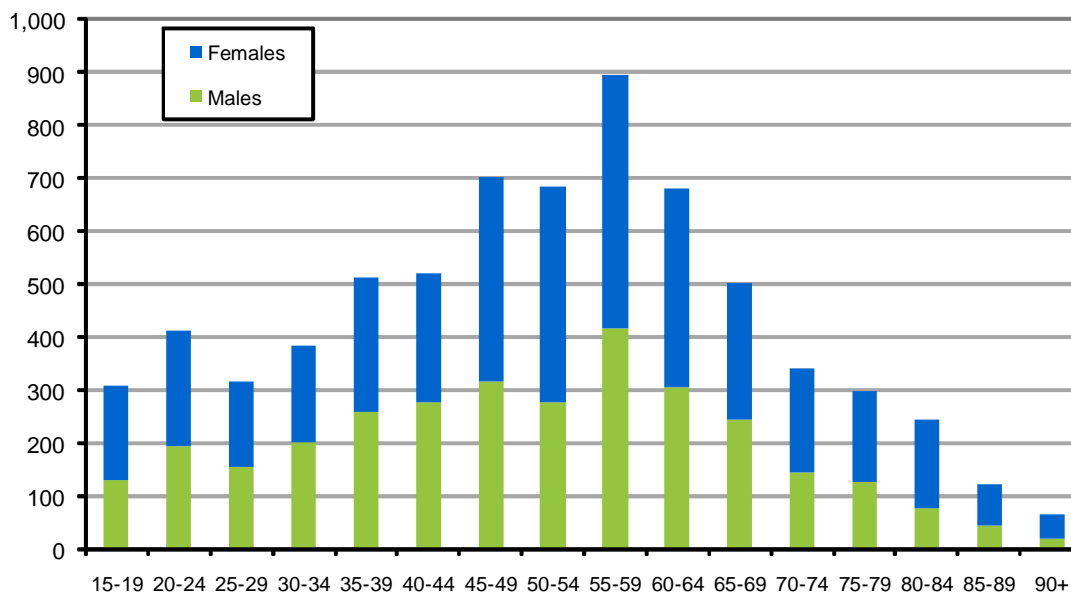
	Allocated expenditure \$ million	Unallocated expenditure \$ million	Total health expenditure \$ million
Chronic pain	6,109	873	6,981

Source: Access Economics based on detailed causes of pain from NSA Pain Study, and health costs from AIHW (2005).

Figure 3-1 shows health expenditure by age and gender.

- Around 55% of total health spending (\$3.8 billion) is on females and 45% (\$3.1 billion) is on males. This reflects the higher prevalence of chronic pain in women.

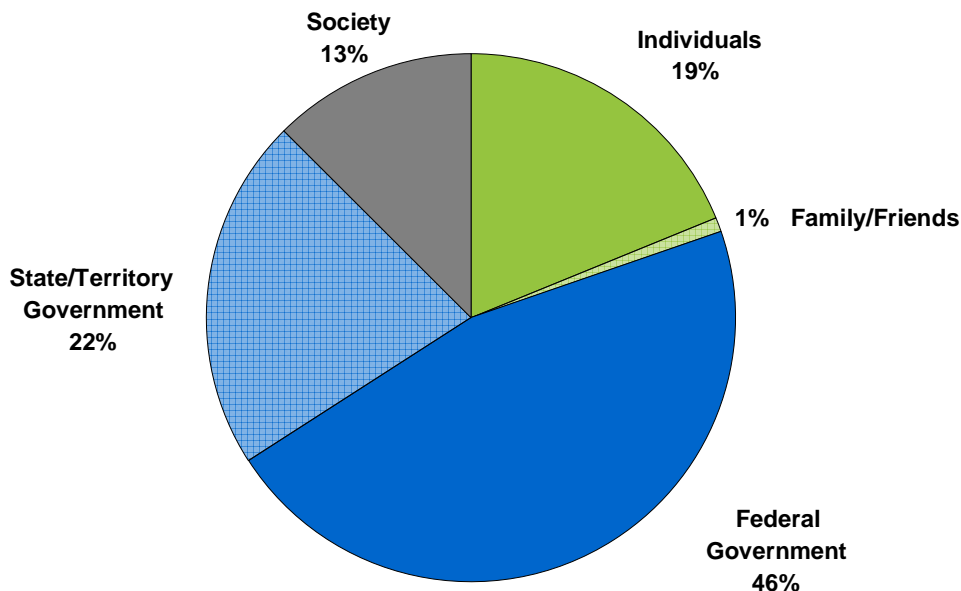
Figure 3-1: Chronic Pain, Total Health Expenditure by Age and Gender, 2007 (\$M)



Source: Access Economics based on AIHW (2005) and the NSA Pain Study.

Health system costs of chronic pain (Figure 3-2) are largely borne by the Federal government (\$3.2 billion) and State and Territory governments (\$1.5 billion). Individuals contribute \$1.3 billion, while society and family/friends make up the remaining \$0.9 billion.

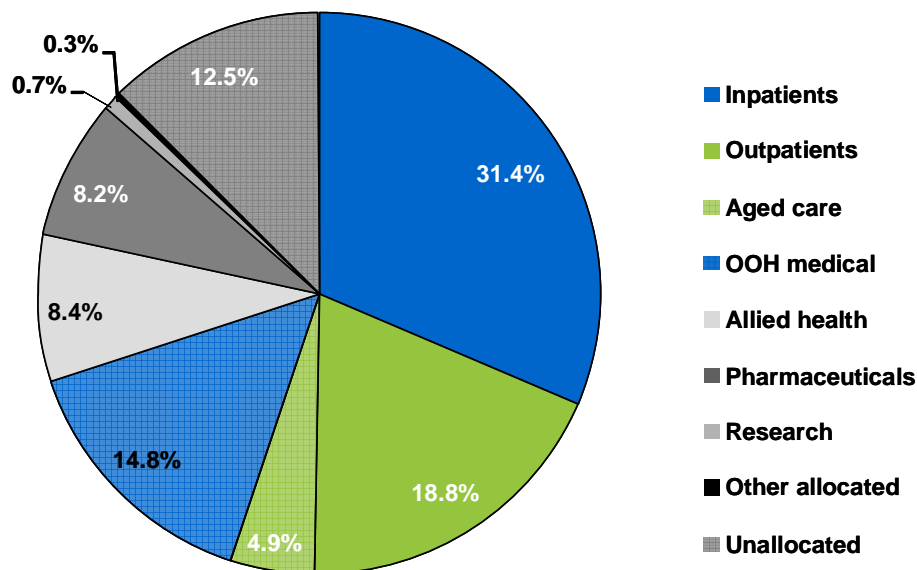
Figure 3-2: Distribution of Health Expenditure by Who Pays



Source: Access Economics based on AIHW (2005) and the NSA Pain Study.
 Note: numbers may not sum to 100% due to rounding.

Half of health system expenditure for people with chronic pain is incurred in the hospital sector, with inpatient costs 31% of the total (\$2.19 billion) and outpatients a further 19% (\$1.3 billion) (Figure 3-3). Out of hospital (OOH) medical costs (GPs, OOH specialists, pathology and imaging services) are around 15% of health costs (\$1.0 billion), while allied health and pharmaceuticals are each a little over 8% (\$590 million and \$570 million respectively). Residential aged care is just under 5% of the total (\$343 million), while research and other allocated costs comprise around 1% of the total (\$68 million). The unallocated component is 12.5% of the total, by definition (\$873 million).

Figure 3-3: Chronic Pain, Health System Costs by Type of Cost, 2007 (%)



Source: Access Economics based on AIHW (2005) and the NSA Pain Study.
 Note: Total = \$7.0 billion.

4. OTHER FINANCIAL COSTS

In addition to health system costs, chronic pain also imposes a number of other important financial costs on society and the economy, including: productivity losses (due to work absenteeism, loss of employment and premature death); carer costs; and deadweight efficiency losses arising from transfer payments to people with chronic pain.

It is important to make the economic distinction between real and transfer costs.

- **Real costs** use up real resources, such as capital or labour, or reduce the economy's overall capacity to produce goods and services.
- **Transfer payments** involve payments from one economic agent to another that do not use up real resources, for example, a disability support pension (DSP), or taxation revenue.

In this report, we estimate two types of indirect costs of chronic pain.

- **Financial costs** (this section) include lost production from chronic pain-related morbidity and the associated deadweight taxation losses, and other financial costs eg. carers, aids and home modifications for those disabled by their persistent pain.
- **Non-financial costs** (Section 5) derive from loss of quality of life – the pain, premature death and loss of life quality that result from chronic pain. These are more difficult to measure, but can be analysed in terms of the years of healthy life lost, both quantitatively and qualitatively, known as the 'BoD', with an imputed value of a 'statistical' life so as to compare these costs with financial costs of chronic pain.

4.1 PRODUCTIVITY LOSSES

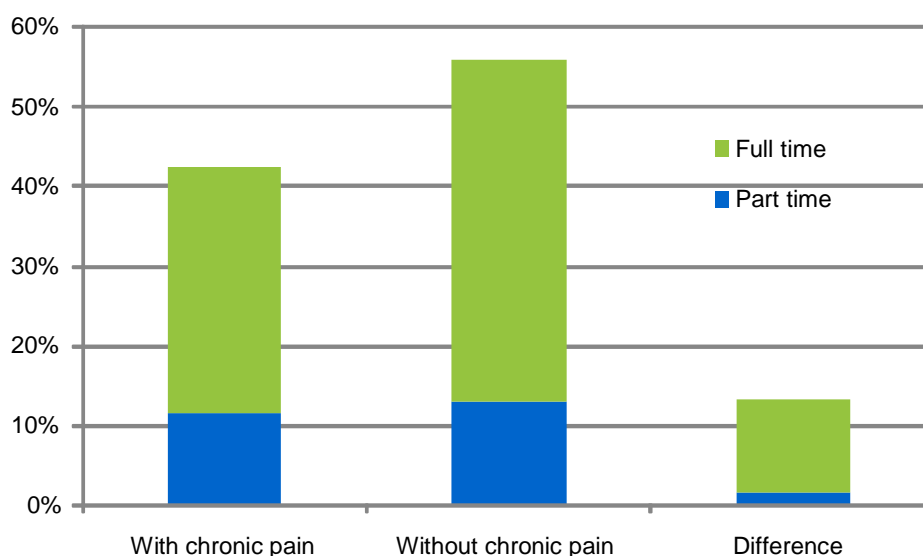
Productivity losses are the cost of production that is lost when people with chronic pain are unable to work because of the condition. They may work less than they otherwise would (either being employed less, being absent more often or being less productive while at work) or they may die prematurely. Access Economics adopts a human capital approach to measurement of productivity losses in developed countries. This report draws on the Australian estimates from the NSA Pain Study of ORs for various productivity parameters, controlling for data quality and other confounding factors.

4.1.1 Employment Impacts

Chronic pain can affect a person's ability to work. If employment rates are lower for people with chronic pain, this loss in productivity represents a real cost to the economy.

As outlined in Table 2-7 earlier, the NSW Health Survey indicated that significantly fewer chronic pain respondents were in full time employment (30.9% people with chronic pain compared to 42.8% for individuals without chronic pain – a difference of 11.9%) or part time employment (11.5% people with chronic pain compared to 12.9% for individuals without chronic pain – a difference of 1.5%, rounded). When weighting these lower levels of employment for people with chronic pain by the distribution of people working full and part time in the general population (71.7% and 28.3% respectively), an 8.9% overall reduction in employment is estimated for people with chronic pain (Figure 4-1).

Figure 4-1: Chronic Pain, Employment Rates, Full and Part Time (%)



Source: Access Economics based on NSW Health Department (1999).

Given AWE for each respective age group, the annual cost of lost earnings due to the reduced employment is estimated at around \$7.8 billion in 2007.

4.1.2 Absenteeism and Presenteeism

The NSA Pain Study found that chronic pain had an impact on work performance both through absence from work due to the pain ('absenteeism') as well as affecting the ability to work effectively when at work ('presenteeism'). As outlined in Table 2-10 earlier, working with pain was more common (on an average 83.8 days with a reduced work effectiveness of 14.2% over a six month period) than lost work days due to pain (4.5 days) among chronic pain participants in full time or part time employment. However, to be conservative due to the substantial uncertainty created by the large standard error, we have used the lower bound of the estimate from the NSA Pain Study. In the case of reduced effectiveness days, the mean minus the standard deviation is $83.8 - 55 = 28.8$ days, which at 14.2% effectiveness equates to 4.1 workdays lost in six months or 8.2 in a twelve month period. There is no further allowance for days absent as the mean minus the standard deviation in that case is less than zero. The same number of days (8.2) is estimated to be lost, for those who do not work, from their household productivity, which is valued at 30% of AWE. Further research is recommended in this area to increase the certainty in the estimates.

Based on these parameters and the AWE of each age-gender group, Access Economics estimates that in 2007, **the total cost of absenteeism and presenteeism due to chronic pain is \$3.8 billion.** This includes \$3.22 billion reduced productivity for people in paid work and \$589 million in reduced productivity at home.

4.1.3 Premature Death

Chronic pain, especially when it is widespread and with a long duration, may be associated with an increased risk of mortality. However, there are relatively few data available regarding

the precise association between chronic pain and mortality. As outlined in Section 2.3.2 above, people with chronic widespread pain may experience overall increased mortality, with the excess in the order of around 30%. However, chronic widespread pain is reported by only around 10% to 13% of adults with any chronic pain. In contrast, the AIHW reports that there is no increased risk of mortality due to chronic back pain (Begg et al, 2007). As a result, there may be a relative risk of mortality of around 1.03 due to chronic pain, which would suggest an estimated 976 deaths due to chronic pain in 2007 (457 males and 519 females). However, Access Economics adopted a conservative approach in this analysis and hence did not attribute mortality costs to chronic pain. Instead, further research is suggested to provide a more robust estimate of the mortality risk.

4.1.4 Lost Taxation Revenue

Reduced earnings due to reduced workforce participation, absenteeism and premature death will also have an effect on taxation revenue collected by the Government. As well as forgone income (personal) taxation, there will also be a fall in indirect (consumption) tax, as those with lower incomes spend less on the consumption of goods and services.

Personal income tax forgone is a product of the average personal income tax rate (18.3%) and the forgone income. With chronic pain and lower income, there will be less consumption of goods and services, with the indirect taxation rate estimated as 15.1%. These average taxation rates are derived for 2007 from the Access Economics macroeconomic model.

Around \$3.7 billion in lost potential tax revenue is estimated to be incurred in 2007, due to the reduced productivity of people with chronic pain.

Lost taxation revenue is considered a transfer payment, rather than an economic cost per se. However, raising additional taxation revenues does impose real efficiency costs on the Australian economy, known as **DWLs**. Administration of the taxation system costs around 1.25% of revenue raised (derived from total amounts spent and revenue raised in 2000-01, relative to Commonwealth department running costs). Even larger DWLs arise from the distortionary impact of taxes on workers' work and consumption choices. These distortionary impacts are estimated to be 27.5% of each tax dollar collected (Lattimore, 1997 and used in Productivity Commission, 2003:6.15-6.16, with rationale). Altogether the DWL is 28.75% of the value of the taxation forgone (Section 4.6).

Access Economics estimates that around **\$1.1 billion in DWL is incurred in 2007**, due to the additional taxation required to replace that forgone due to lost productivity of people with chronic pain (Table 4-1).

Table 4-1: Lost Earnings and Taxation Due to Chronic Pain, 2007

Average personal income tax rate*	18.3%
Potential personal income tax lost	\$2.02 billion
Average indirect tax rate*	15.1%
Potential indirect tax lost	\$1.67 billion
total potential tax revenue lost	\$3.69 billion
DWL from additional taxation	\$1.06 billion

* Source: Access Economics macroeconomic model (2007).

Welfare payments made to people who are no longer working must, in a budget-neutral setting, also be funded by additional taxation. The DWLs associated with welfare transfers are calculated in Section 4.6, where the nature of DWLs is explained in more detail.)

4.2 CARER COSTS

Carers are people who provide informal care to others in need of assistance or support. Most informal carers are family or friends of the person receiving care. Carers may take time off work to accompany people with chronic pain to medical appointments, stay with them in hospital, or care for them at home. Carers may also take time off work to undertake many of the unpaid tasks that the person with chronic pain would do if they did not have chronic pain and were able to do these tasks.

Informal care is distinguished from services provided by people employed in the health and community sectors (formal care) because the care is generally provided free of charge to the recipient and is not regulated by the government.

While informal care is provided free of charge, it is not free in an economic sense, as time spent caring is time that cannot be directed to other activities such as paid work, unpaid work (such as housework or yard work) or leisure. As such, informal care is a use of economic resources.

4.2.1 Methodology

There are three potential methodologies that can be used to place a dollar value on the informal care provided.

- **Opportunity cost** is the value of lost wages forgone by the carer.
- **Replacement valuation** is the cost of buying a similar amount of services from the formal care sector.
- **Self-valuation** is what carers themselves feel they should be paid.

Access Economics has adopted the opportunity cost method in this report as it provides the most accurate estimate of carer costs and sufficient demographic data on providers of care for people with chronic pain are available.

4.2.2 Informal and Community Care Costs

Informal care costs are the value of the care provided by informal friends or family carers. This report analyses the available epidemiological data (from Australia and overseas) together with data from the ABS SDAC (ABS, 2003), to gain estimates of the total number of hours of care provided to people with chronic pain in 2007, and the average unit cost of that care.

Community care costs include those costs associated with chronic pain that are not captured in formal health sector costs. Examples include the cost of services provided to assist with rehabilitation, mobility or independent living, the costs of aids and modifications to the homes of people with chronic pain, and travel to health services. Estimates of these costs for 2007 are based on investigation of the available data and literature on usage rates and on unit costs.

Data from the 2003 SDAC sourced specifically for this report identified around, 194,000 carers who cared for people with 'chronic or recurrent pain or discomfort' and 208,500 carers

who cared for people without chronic pain. The age-gender distribution of these carers is shown in Table 4-2. To allow for the people with chronic pain who would have received care anyway (even in the absence of the pain), it is necessary to identify the 'excess' amount of care provided to people with chronic pain. In total, 6.6% of people with chronic pain had a carer compared to 1.2% of those who did not. The difference was 5.3% or 168,892 people with chronic pain in 2007 who had a carer, who are estimated would not have had one in the absence of the chronic pain.

Table 4-2: Carers of People With and Without Chronic Pain, 2003

Carer demographic characteristics	With chronic pain		Without chronic pain		Difference	People**
	'000	% people with chronic pain*	'000	% people without chronic pain*		
Males						
15-64 years	53	1.80%	34.3	0.20%	1.60%	50,380
65+ years	30.5	1.00%	16.6	0.10%	0.90%	29,579
Total	83.5	2.80%	50.9	0.30%	2.50%	79,959
Females						
15-64 years	82.4	2.80%	124.2	0.70%	2.10%	65,068
65+ years	28.1	1.00%	33.3	0.20%	0.80%	23,883
Total	110.5	3.70%	157.5	0.90%	2.80%	88,952
People						
15-64 years	135.4	4.60%	158.6	0.90%	3.60%	115,429
65+ years	58.6	2.00%	49.9	0.30%	1.70%	53,463
Total	194	6.60%	208.5	1.20%	5.30%	168,892

* In 2003 there were an estimated 2.953 million Australians with chronic pain, and \$16.919 million Australians without.

** Multiplying the difference in the previous column by the number of people with chronic pain in 2007.

Assuming that the split between primary and non-primary carers is the same as for the population as a whole, there were an estimated 31,183 primary and 137,727 non-primary carers in 2007 for people with chronic pain. Based on the demographic characteristics of carers from the SDAC data, of these carers, 15,864 and 70,065 respectively are estimated to be employed.

SDAC data were also available for the average number of hours of care provided by primary carers. of primary carers, 28.5% provided less than 20 hours of care per week on average, 18.4% provided between 20 and 40 hours and 44.2% provided more than 40 hours (with the remaining 8.8% not stating the number of care hours provided). Using these data, Access Economics conservatively calculated there was a weighted average of 26 hours of informal care per week provided by primary carers of people with chronic pain. For non-primary carers, an estimate of five hours per week was made, in line with previous studies (eg. Access Economics, 2005).

Based on these findings and incorporating age-gender AWE in Australia, **Access Economics estimates that in 2007 the total cost of care for people with chronic pain is around \$1.3 billion.** This equates to \$406 per person with chronic pain in 2007.

4.3 COSTS OF AIDS AND MODIFICATIONS

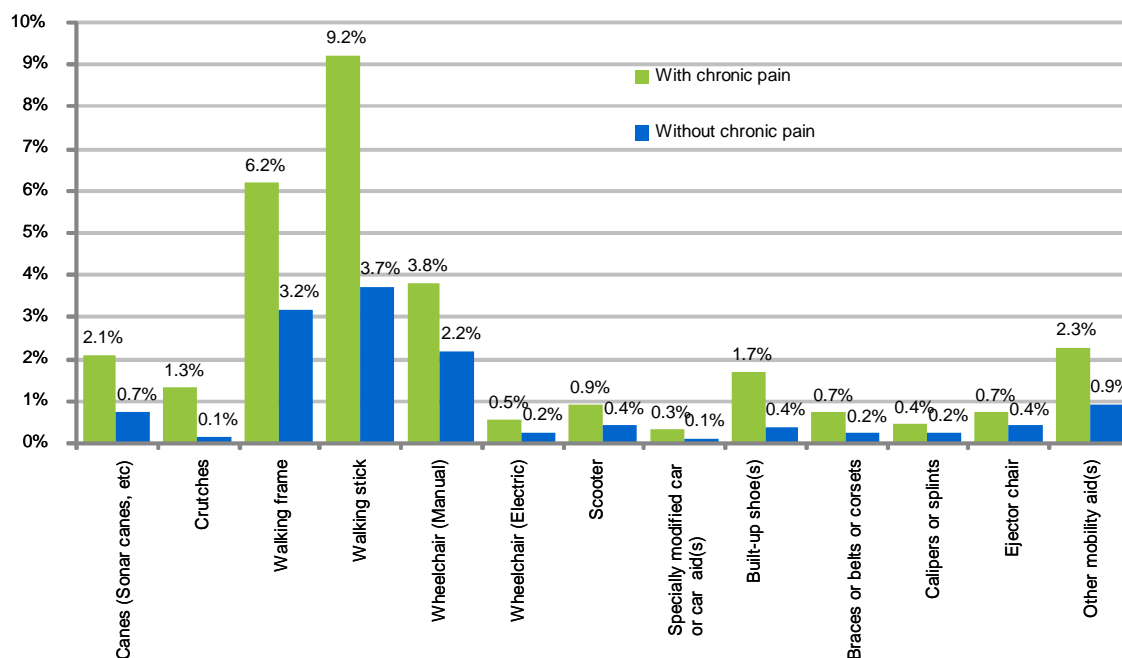
Chronic pain, especially in its more disabling forms, has the potential to affect a person’s ability to conduct their daily activities and this may result in the need to acquire aids and devices to assist them in carrying out these tasks. People with chronic pain may also need to make modifications to their homes, such as adding handrails and ramps in order to ensure they can safely conduct their lives.

Results from SDAC show that of those who reported chronic or recurrent pain or discomfort:

- 54.8% used self care aids compared to 43.4% without;
- 18.8% used mobility aids compared to 8.4% without;
- 23.4% used communication aids compared to 22.4% without; and
- 14.6% made modifications to their home compared to 8.1% without.

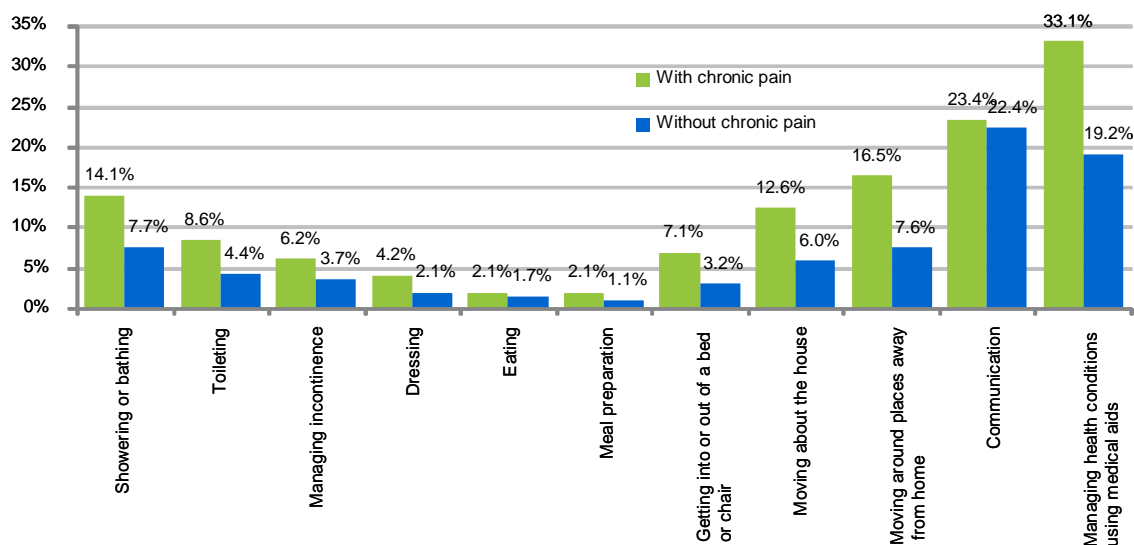
The difference in utilisation for each type of aid was calculated from the SDAC data. Examples are provided of these differences in usage for mobility aids in Figure 4-3 and for self-care in Figure 4-4.

Figure 4-2: Mobility Aids Used by People With and Without Chronic Pain, 2003



Source: SDAC special data request.

Figure 4-3: Self-Care Aids Used by People With and Without Chronic Pain, 2003



Source: SDAC special data request.

Differences in utilisation rates were used to estimate the number of ‘excess’ aids and modifications used by people with chronic pain, relative to people without chronic pain. Cost estimates for various products were based on prices provided by the Independent Living Centre NSW, the Victorian Aids and Equipment Program and previous studies undertaken by Access Economics, inflated to 2007 prices. While some equipment and modifications require large outlays but are depreciated over a number of years, other devices need to be replaced more regularly. It was assumed that devices in heavy use (eating, dressing and continence aids and batteries) need to be replaced on an annual basis, while most other devices – with a cost range of between \$32 and \$213 (showering and toileting aids and most mobility aids such as canes, crutches, walking sticks and frames) – have a lifespan of three years, and larger expenses such as wheelchairs (\$5,330) and hearing aids (\$2,665) were depreciated over five years. Home modifications (\$7,995) tend to be one-off investments, so their lifespan was assumed to be 20 years (Table 4-4).

Overall, the cost for aids and equipment for people with chronic pain was estimated at around \$331.7 million in 2007 – or \$105 per person with chronic pain.

As it is not known how much of this cost is subsidised by governments, paid for by the person with chronic pain or their family and friends, or paid for through community programs, the amount is allocated in four equal portions to the Federal Government, State Government, family and friends and society/other.

Table 4-3: Chronic Pain, Aids and Equipment Prices, Estimated Product Life and Total Costs, 2007

	Device	Minimum Price (\$)	Product life (years)	Unit cost (\$ per annum)	Number of devices used	Total cost (\$ per annum)
Self Care	Eating aids ¹	\$107	1	\$107	12,996	1,385,451
	Showering or bathing aids ²	\$91	3	\$30	200,693	6,061,926
	Dressing aids ¹	\$21	1	\$21	67,731	1,444,090
	Toileting aids ²	\$85	3	\$28	131,118	3,727,436
	Managing incontinence ¹	\$1,279	1	\$1,279	79,174	101,285,008
	Total Self Care			\$232	491,712	\$ 113,903,912
Mobility aids	Canes ²	\$32	3	\$11	43,260	\$461,181
	Walking stick ²	\$32	3	\$11	173,910	\$1,853,981
	Crutches	\$53	3	\$18	36,551	\$649,426
	Walking frame ¹	\$320	3	\$107	95,512	\$10,182,154
	Wheelchair or scooter ¹	\$5,330	5	\$1,066	76,234	\$81,269,774
	Specially modified car or car aid ²	\$213	3	\$71	6,283	\$446,527
	Other mobility aids ⁴		3	\$214	116,658	\$24,941,871
Total Mobility Aids			\$218	548,409	\$119,804,913	
Communication aids	Communication aids (electronic, non-electronic and other hearing and communication aids) ³	\$2,665	5	\$533	29,585	\$15,769,867
	Total Communication aids			\$533	29,585	\$15,769,867
Home modifications	Home modifications (incl structural changes, ramps, bath modifications, doors widened, handrails, etc) ⁵	\$7,995	20	\$400	205,706	\$ 82,235,340
	Total Home modifications			\$400	205,706	\$82,235,340
People using aids & equipment				\$558	594,435	\$ 331,714,032
People not using aids & equipment					2,570,558	\$ -
People with chronic pain					3,164,993	\$ 331,714,032

Sources: ABS (2003)¹; Victorian Aids and Equipment Program²; Independent Living Centre NSW³; Access Economics (2006a)⁴; ⁴ average of mobility aids; ⁵ Access Economics (2006b) Note: People may use multiple devices.

4.4 WELFARE AND INCOME SUPPORT

Transfer payments represent a shift of resources from one economic entity to another. The act of taxation and redistribution creates distortions and inefficiencies in the economy, so transfers also involve real net costs to the economy.

Data regarding the number of people on income support payments was sourced from Centrelink Australia, specially for this report. The most commonly received Centrelink work related benefit was the DSP, which 7,399 people living with chronic pain were receiving in June 2007. There were also 1,978 people with chronic pain receiving NewStart Allowance (NA) and 49 people receiving Sickness Allowance (SA), due to their chronic pain.

The value of these payments in 2007 is estimated to be around \$109 million⁴. However, some of these people would have ordinarily received welfare payments, which must be netted out to estimate the additional welfare payments due to chronic pain, using a Melbourne University study (Tseng and Wilkins, 2002) about the 'reliance' of the general population (aged 15-64 years) on income support of around 12%. Factoring down the \$109 million by this 12% gives a **cost of welfare reliance on DSP, NA and SA due to allergy of around \$95 million per annum in 2007.**

4.5 DEADWEIGHT LOSSES

The welfare payments calculated immediately above are, like taxation revenue losses, not themselves economic costs but, rather, a financial transfer from taxpayers to the income support recipients. The real resource cost of these transfer payments is only the associated DWL.

DWLs refer to the costs of administering welfare pensions and raising additional taxation revenues. Although invalid and sickness benefits and forgone taxation are transfers, not real costs (so should not be included in the estimation of total costs) it is still worthwhile estimating them as that helps us understand how the total costs of chronic pain are shared between the taxpayer, the individual and other financiers.

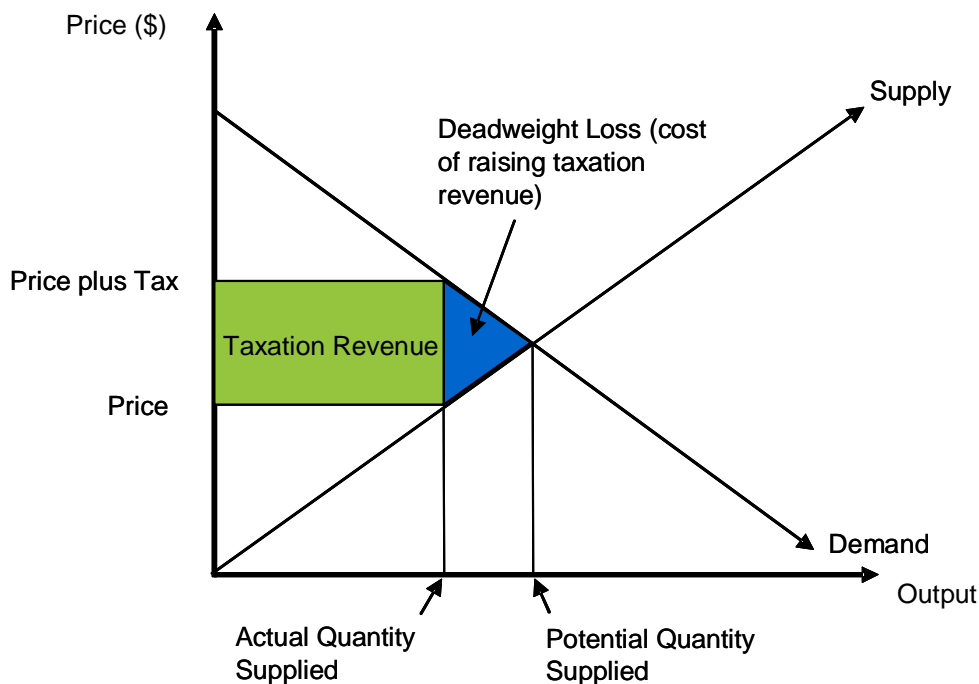
There are two sources of lost tax revenue that result from the lower earnings – the potential income tax forgone and the potential indirect (consumption) tax forgone. The latter is lost because, as income falls, so does consumption of goods and services. The average personal income tax rate used is 18.3% and the average indirect taxation rate used is 15.1%, based on parameters for 2007 from the Access Economics macroeconomic model.

Transfer payments (Government payments/services and taxes) are not a net cost to society as they represent a shift of consumption power from one group of individuals to another in society. If the act of taxation did not create distortions and inefficiencies in the economy, then transfers could be made without a net cost to society. However, through these distortions, taxation does impose a DWL on the economy.

DWL is the loss of consumer and producer surplus, as a result of the imposition of a distortion to the equilibrium (society preferred) level of output and prices. Taxes alter the price and quantity of goods sold compared to what they would be if the market were not distorted, and thus lead to some diminution in the value of trade between buyers and sellers that would otherwise be enjoyed (Figure 4-5).

⁴ Based on a payment of \$446.60 per fortnight for DSP; and \$429.80 for NA and SA.

Figure 4-4: DWL of Taxation



The rate of DWL used in this report is 27.5 cents per \$1 of tax revenue raised plus 1.25 cents per \$1 of tax revenue raised for Australian Taxation office administration, based on Productivity Commission (2003) in turn derived from Lattimore (1997), ie, 28.75% overall. The total extra tax dollars required to be collected include:

- the value of government services provided (including the government-funded component of health system costs, with \$1.36 billion of DWL);
- the taxation revenue lost as a result of chronic pain and its impacts (with \$1.19 billion of DWL in the case of chronic pain); and
- the additional induced social welfare payments required to be paid (with \$27 million of DWL).

Thus the DWL for people with chronic pain in 2007 is estimated at around \$2.6 billion.

4.6 SUMMARY OF OTHER (NON-HEALTH) FINANCIAL COSTS

In total, the non-health related financial costs of chronic pain are estimated to be around \$15.8 billion in 2007.

Table 4-4: Summary of Other (Non-Health) Financial Costs of Chronic Pain, 2007

	\$ million
Productivity costs	11,651.8
Employment impacts	7,841.2
Absenteeism	3,810.5
Carer costs	1,285.4
Aids and modifications	331.7
Deadweight loss	2,574.0
Total other financial costs	15,842.9

5. BURDEN OF DISEASE

5.1 METHODOLOGY – VALUING LIFE AND HEALTH

Since Schelling's (1968) discussion of the economics of life saving, the economic literature has properly focused on **willingness to pay** (willingness to accept) measures of mortality and morbidity risk. Using evidence of market trade-offs between risk and money, including numerous labour market and other studies (such as installing smoke detectors, wearing seatbelts or bike helmets etc), economists have developed estimates of the **Value of a 'Statistical' Life (VSL)**.

The willingness to pay approach estimates the value of life in terms of the amounts that individuals are prepared to pay to reduce risks to their lives. It uses stated or revealed preferences to ascertain the value people place on reducing risk to life and reflects the value of intangible elements such as quality of life, health and leisure. While it overcomes the theoretical difficulties of the human capital approach, it involves more empirical difficulties in measurement (BTE, 2000, pp20-21).

Viscusi and Aldy (2002) summarise the extensive literature in this field, most of which has used econometric analysis to value mortality risk and the 'hedonic wage' by estimating compensating differentials for on-the-job risk exposure in labour markets, in other words, determining what dollar amount would be accepted by an individual to induce him/her to increase the possibility of death or morbidity by a given percentage. They find the VSL ranges between US\$4 million and US\$9 million with a median of US\$7 million (in year 2000 US dollars), similar but marginally higher than the VSL derived from US product and housing markets, and also marginally higher than non-US studies, although all in the same order of magnitude. They also review a parallel literature on the implicit value of the risk of non-fatal injuries.

A particular life may be regarded as priceless, yet relatively low implicit values may be assigned to life because of the distinction between identified and anonymous (or 'statistical') lives. When a 'value of life' estimate is derived, it is not any particular person's life that is valued, but that of an unknown or statistical individual (Bureau of Transport and Regional Economics, 2002, p19).

Weaknesses in this approach, as with human capital, are that there can be substantial variation between individuals. Extraneous influences in labour markets such as imperfect information, income/wealth or power asymmetries can cause difficulty in correctly perceiving the risk or in negotiating an acceptably higher wage.

Viscusi and Aldy (2002) include some Australian studies in their meta-analysis, notably Kniesner and Leeth (1991) of the ABS with VSL of US\$4.2 million and Miller et al (1997) of the National Occupational Health and Safety Commission (NOHSC) with quite a high VSL of US\$11.3m-19.1 million (Viscusi and Aldy, 2002, Table 4, pp92-93). Since there are relatively few Australian studies, there is also the issue of converting foreign (US) data to Australian dollars using either exchange rates or purchasing power parity (PPP) and choosing a period.

Access Economics (2003) presents outcomes of studies from Yale University (Nordhaus, 1999) – where VSL is estimated as \$US2.66m; University of Chicago (Murphy and Topel, 1999) – US\$5m; Cutler and Richardson (1998) – who model a common range from US\$3m

to US\$7m, noting a literature range of \$US0.6m to \$US13.5m per fatality prevented (1998 US dollars). These eminent researchers apply discount rates of 0% and 3% (favouring 3%) to the common range to derive an equivalent of \$US 75,000 to \$US 150,000 for a year of life gained.

5.1.1 DALYs and Quality Adjusted Life Years (QALYs)

In an attempt to overcome some of the issues in relation to placing a dollar value on a human life, in the last decade an alternative approach to valuing human life has been derived. The approach is non-financial, where pain, suffering and premature mortality are measured in terms of DALYs, with 0 representing a year of perfect health and 1 representing death (the converse of a QALY where 1 represents perfect health). This approach was developed by WHO, the World Bank and Harvard University and provides a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990, projected to 2020 (Murray and Lopez, 1996). Methods and data sources are detailed further in Murray et al (2001).

The DALY approach has been adopted and applied in Australia by the AIHW with a separate comprehensive application in Victoria. Mathers et al (1999) from the AIHW estimate the BoD and injury in 1996, including separate identification of premature mortality; YLL, and morbidity; YLD components. In any year, the disability weight of a disease (for example, 0.18 for a broken wrist) reflects a relative health state. In this example, 0.18 would represent losing 18% of a year of healthy life because of the inflicted injury.

The DALY approach has been successful in avoiding the subjectivity of individual valuation and is capable of overcoming the problem of comparability between individuals and between nations, although nations have subsequently adopted variations in weighting systems. For example, in some countries DALYs are age-weighted for older people although in Australia the minority approach is adopted – valuing a DALY equally for people of all ages.

The main problem with the DALY approach is that it is not financial and is thus not directly comparable with most other cost measures. In public policy making, therefore, there is always the temptation to re-apply a financial measure conversion to ascertain the cost of an injury or fatality or the value of a preventive health intervention. Such financial conversions tend to utilise “willingness to pay” or risk-based labour market studies described above.

The Department of Health and Ageing (based on work by Applied Economics) adopted a very conservative approach to this issue, placing the value of a human life year at around A\$60,000 per annum, which is lower than most international lower bounds on the estimate.

“In order to convert DALYs into economic benefits, a dollar value per DALY is required. In this study, we follow the standard approach in the economics literature and derive the value of a healthy year from the value of life. For example, if the estimated value of life is A\$2 million, the average loss of healthy life is 40 years, and the discount rate is 5% per annum, the value of a healthy year would be \$118,000.⁵ Tolley, Kenkel and Fabian (1994) review the literature on valuing life and life years and conclude that a range of US\$70,000 to US\$175,000 per life year is reasonable. In a major study of the value of health of the US population, Cutler and Richardson (1997) adopt an average value of US\$100,000 in 1990 dollars for a healthy year.

⁵ In round numbers, \$2,000,000 = \$118,000/1.05 + \$118,000/(1.05)² + ... + \$118,000/(1.05)⁴⁰

Although there is an extensive international literature on the value of life (Viscusi, 1993), there is little Australian research on this subject. As the Bureau of Transport Economics (BTE) (in BTE, 2000) notes, international research using willingness to pay values usually places the value of life at somewhere between A\$1.8 and A\$4.3 million. On the other hand, values of life that reflect the present value of output lost (the human capital approach) are usually under \$1 million.

The BTE (2000) adopts estimates of \$1 million to \$1.4 million per fatality, reflecting a 7% and 4% discount rate respectively. The higher figure of \$1.4 million is made up of loss of workforce productivity of \$540,000, loss of household productivity of \$500,000 and loss of quality of life of \$319,000. This is an unusual approach that combines human capital and willingness to pay concepts and adds household output to workforce output.

For this study, a value of \$1 million and an equivalent value of \$60,000 for a healthy year are assumed.⁶ In other words, the cost of a DALY is \$60,000. This represents a conservative valuation of the estimated willingness to pay values for human life that are used most often in similar studies.⁷” (DHA, 2003, pp11-12).”

As the citation concludes, the estimate of \$60,000 per DALY is very low. The Viscusi (1993) meta-analysis referred to reviewed 24 studies with values of a human life ranging between \$US 0.5 million and \$US 16m, all in pre-1993 US dollars. Even the lowest of these converted to 2003 Australian dollars at current exchange rates, exceeds the estimate adopted (\$1m) by nearly 25%. The BTE study tends to disregard the literature at the higher end and also adopts a range (A\$1-\$1.4m) below the lower bound of the international range that it identifies (A\$1.8-\$4.3m).

The rationale for adopting these very low estimates is not provided explicitly. Certainly it is in the interests of fiscal restraint to present as low an estimate as possible.

In contrast, the majority of the literature as detailed above appears to support a higher estimate for VSL, as presented in Table 5-1, which Access Economics believes is important to consider in disease costing applications and decisions. The US dollar values of the lower bound, midrange and upper bound are shown at left. The ‘average’ estimate is the average of the range excluding the high NOHSC outlier. Equal weightings are used for each study as the:

- Viscusi and Aldy meta-analysis summarises 60 recent studies;
- ABS study is Australian; and
- Yale and Harvard studies are based on the conclusions of eminent researchers in the field after conducting literature analysis.

Where there is no low or high US dollar estimate for a study, the midrange estimate is used to calculate the average. The midrange estimates are converted to Australian dollars at PPP (as this is less volatile than exchange rates) of USD=0.7281AUD for 2003 as estimated by the OECD.

⁶ The equivalent value of \$60,000 assumes, in broad terms, 40 years of lost life and a discount rate of 5 per cent. [Access Economics comment: More accurately the figure should be \$58,278.]

⁷ In addition to the cited references in the text, see for example Murphy and Topel’s study (1999) on the economic value of medical research.

Access Economics concludes the VSL range in Australia lies between \$3.7m and \$9.6m⁸, with a mid-range estimate of \$6.5m. These estimates have conservatively not been inflated to 2004 prices, given the uncertainty levels.

Table 5-1: International Estimates of VSL, Various Years

	US\$m			A\$m
	Lower	Midrange	Upper	0.7281
Viscusi and Aldy meta-analysis 2002	4	7	9	9.6
Australian: ABS 1991		4.2		5.8
NOHSC 1997	11.3		19.1	
Yale (Nordhaus) 1999		2.7		3.7
Harvard (Cutler and Richardson) 1998	0.6	5	13.7	6.9
Average*	2.9	4.7	7.4	6.5

* Average of range excluding high NOHSC outlier, using midrange if no data; conservatively not inflated A\$m conversions are at the OECD 2003 PPP rate.

5.1.2 Discount Rates

A discount rate is used to convert future income or a cost stream into the equivalent value in today's dollars.

Choosing an appropriate discount rate for present valuations in cost analysis is a subject of some debate, and can vary depending on what type of future income or cost stream is being considered. There is a substantial body of literature, which often provides conflicting advice, on the appropriate mechanism by which costs should be discounted over time, properly taking into account risks, inflation, positive time preference and expected productivity gains.

The absolute minimum option that one can adopt in discounting future income and costs is to set future values in current day dollar terms on the basis of a risk free assessment about the future (that is, assume the future flows are similar to the certain flows attaching to a long term Government bond).

Wages should be assumed to grow in dollar terms according to best estimates for inflation and productivity growth. In selecting discount rates for this project, we have thus settled upon the following as the preferred approach.

- **Positive time preference:** Access Economics uses the long term nominal bond rate of 5.8% pa (from recent history) as the parameter for this aspect of the discount rate (If there were no positive time preference, people would be indifferent between having something now or a long way off in the future, so this applies to all flows of goods and services).
- **Inflation:** The Reserve Bank has a clear mandate to pursue a monetary policy that delivers 2% to 3% inflation over the course of the economic cycle. This is a realistic longer run goal and we therefore use a value of 2.5% pa for this variable (It is important to allow for inflation in order to derive a real (rather than nominal) rate).

⁸ Calculated from the non-indexed studies themselves. Converting the Access Economics average estimates from USD to AUD at PPP would provide slightly higher estimates - \$3.9 million and \$10.2m, with the same midrange estimate.

- **Productivity growth:** The Commonwealth Government's *Intergenerational Report 2007* assumed productivity growth of 1.5% in the decade to 2010 and 1.75% thereafter. We suggest 1.75% for the purposes of this analysis as many of the productivity costs extend past 2010.

There are then three different real discount rates that should be applied.

- To discount income streams of future earnings, the discount rate is:
 $5.8 - 2.5 - 1.75 = 1.55\%$.
- To discount health costs, the discount rate is:
 $5.8 - (3.2 - 1.75) - 1.75 = 2.6\%$.
- To discount other future streams (healthy life) the discount rate is:
 $5.8 - 2.5 = 3.3\%$

While there may be sensible debate about whether health services (or other costs with a high labour component in their costs) should also deduct productivity growth from their discount rate, we argue that these costs grow in real terms over time significantly as a result of other factors such as new technologies and improved quality, and we could reasonably expect this to continue in the future.

Discounting the VSL of \$3.7m from Table 5-1 by the discount rate of 3.3% over an average 40 years expected life span (the average from the meta-analysis of wage-risk studies) provides an estimate of the VSLY of \$162,561.

5.2 BURDEN OF DISEASE DUE TO CHRONIC PAIN

5.2.1 Disability Weight

One of the main costs of chronic pain is the loss of wellbeing and quality of life that it entails. This can be estimated by initially allocating a disability weight to chronic pain.

The disability weights used in this study are based originally on those calculated by the AIHW (Mathers et al, 1999), adjusted for comorbidities in people with chronic pain.

- The disability weight of 0.060 for people with chronic back pain and chronic musculoskeletal conditions was used and then adjusted for comorbidities to conservatively estimate an overall disability weight for people with chronic pain of 0.037.

5.2.2 Years of Life Lost Due to Disability

Based on the disability weight outlined above and the total number of people experiencing chronic pain, the YLD for chronic pain has been calculated by gender (Table 5-2).

Table 5-2: Estimated Years of Healthy Life Lost Due to Disability (YLD)

	Estimated disability weight	Prevalence	YLD
Males	0.037	1,436,693	52,993
Females	0.037	1,728,300	63,749

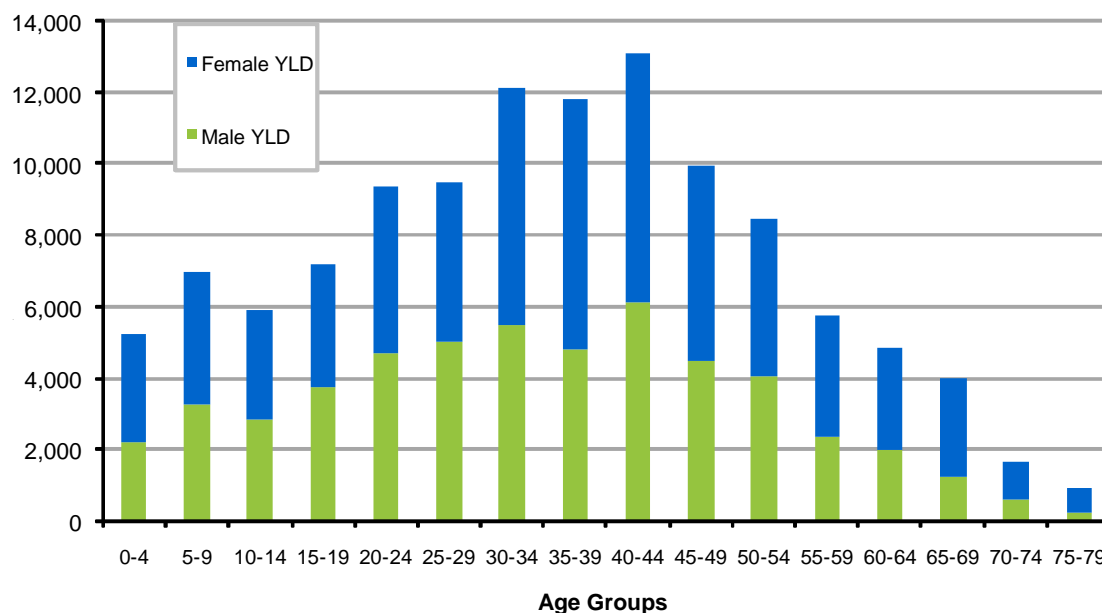
5.2.3 Years of Life Due to Premature Death

Adopting the conservative approach to deaths from chronic pain discussed in Section 4.1.3, no YLL are attributed to the cost burden of chronic pain in this analysis.

5.2.4 Total DALYs Due to Chronic Pain

The overall loss of wellbeing due to chronic pain is shown in Figure 5-1, which illustrates YLD due to chronic pain totalling 116,742 DALYs. The greatest impact of chronic pain is in the 40-44 age group, reflecting the higher YLD due to the large number of Australians with chronic pain in this cohort. Indicative of the greater prevalence and hence greater YLD, it can also be seen that the greatest loss of wellbeing due to chronic pain in Australia is among women.

Figure 5-1: Loss of Wellbeing Due to Chronic Pain (DALYs), by Age and Gender, 2007



Multiplying the number of DALYs by the VSLY (\$162,561) provides an estimate of the gross dollar value of the loss of wellbeing due to chronic pain.

The estimated gross cost of lost wellbeing from chronic pain is \$18.9 billion in 2007.

5.2.5 Net Value of A Healthy Life Lost

Bearing in mind that the wage-risk studies underlying the calculation of the VSL take into account all known personal impacts – suffering and premature death, lost wages/income, out-of-pocket personal health costs and so on – the estimate of \$18.9 billion should be treated as a ‘gross’ figure. However, costs specific to chronic pain that are unlikely to have entered into the thinking of people in the source wage/risk studies should not be netted out (eg. publicly financed health spending, care provided voluntarily). The results after netting out are presented in Table 5.4.

Table 5-3: Net Cost of Lost Wellbeing, \$ Million, 2007

Gross cost of wellbeing	18,978
Less production losses net of tax	6,155
Less health costs borne out-of-pocket	1,315
Net cost of lost wellbeing	11,507

The net cost of lost wellbeing due to chronic pain is estimated to be \$11.5 billion in 2007.

6. SUMMARY OF ECONOMIC IMPACTS

The economic cost of chronic pain in 2007 is summarised in Table 6-1.

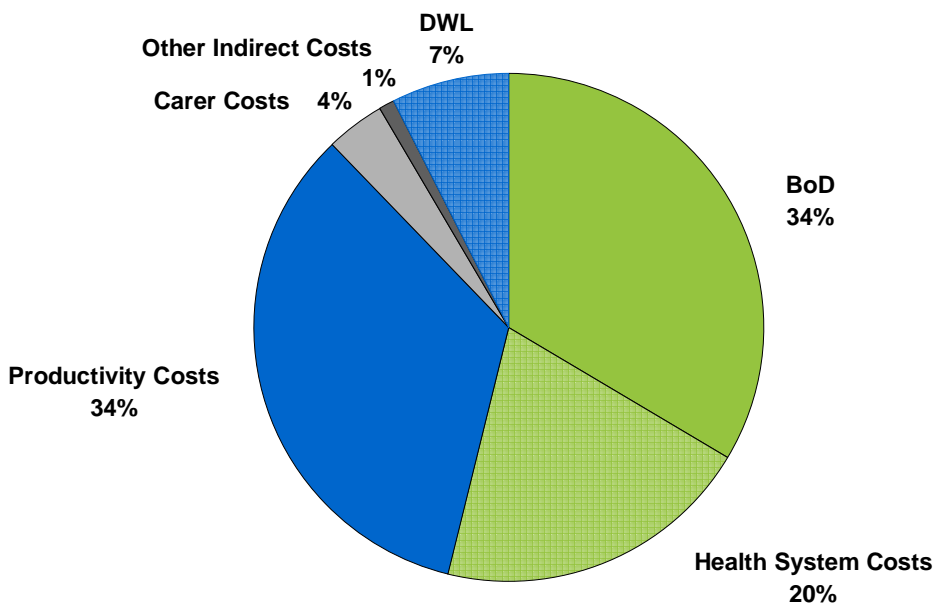
- The total cost of chronic pain was estimated at \$34.3 billion – or \$10.847 per person with chronic pain.
- The total financial cost of chronic pain was \$22.8 billion in 2007. This excludes the burden of disease (BoD) component.
 - These are real economic costs that include productivity losses (51%), health system costs (31%), DWLs (11%), carer costs (6%) and other indirect costs (1%).

Table 6-1: Chronic Pain Cost Summary, 2007

	Individuals	Family/ Friends	Federal Government	State and Territory Governments	Employers	Society/ Other	Total
Total cost (\$ million)							
Burden of disease	11,507	0	0	0	0	0	11,507
Health system costs	1,315	61	3,225	1,508	0	873	6,981
Productivity costs	6,155	0	3,695	0	1,801	0	11,652
Carer costs	0	856	429	0	0	0	1,285
Other Indirect costs	0	83	83	83	0	83	332
Deadweight losses	0	0	0	0	0	2,574	2,574
Transfers	-95	0	95	0	0	0	0
Total financial costs	7,375	1,000	7,528	1,591	1,801	3,530	22,824
Total costs including burden of disease	18,882	1,000	7,528	1,591	1,801	3,530	34,332
Cost per person with chronic pain (\$)							
Burden of disease	3,636	0	0	0	0	0	3,636
Health system costs	415	19	1,019	476	0	276	2,206
Productivity costs	1,945	0	1,167	0	569	0	3,681
Carer costs	0	270	136	0	0	0	406
Other Indirect costs	0	26	26	26	0	26	105
Deadweight losses	0	0	0	0	0	813	813
Transfers	-30	0	30	0	0	0	0
Total financial costs	2,330	316	2,379	503	569	1,115	7,211
Total costs including burden of disease	5,966	316	2,379	503	569	1,115	10,847

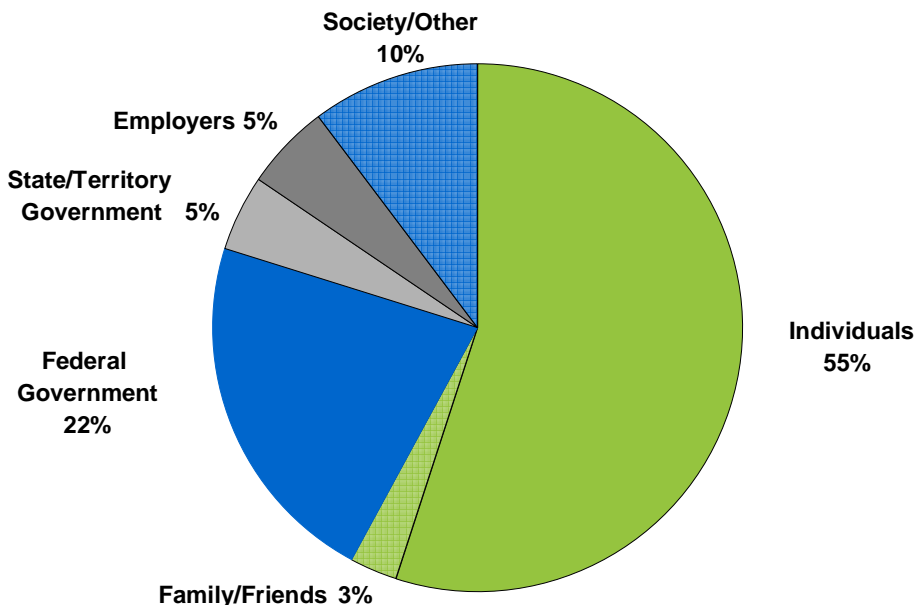
When analysing the total costs of chronic pain in 2007, productivity costs are the largest component, comprising around \$11.7 billion (34%) and reflecting the relatively high impact on work performance and employment outcomes caused by chronic pain. BoD accounts for the next largest share at around \$11.5 billion (also around 34%). Health system costs represent a further \$7.0 billion (20%) - capturing the considerable inpatient, outpatient and OOH medical costs, as well as smaller costs such as pharmaceuticals, other professional services and residential aged care. The opportunity cost of informal care is around \$1.3 billion (4%), while other indirect costs (such as aids and modifications) are around \$0.3 billion – or 1% of total costs. DWLs from transfer payments (taxation revenue forgone and welfare payments – notably DSP and NA) comprise the final \$2.6 billion (7% of total estimated costs).

Figure 6-1: Total Costs of Chronic Pain by Type, 2007



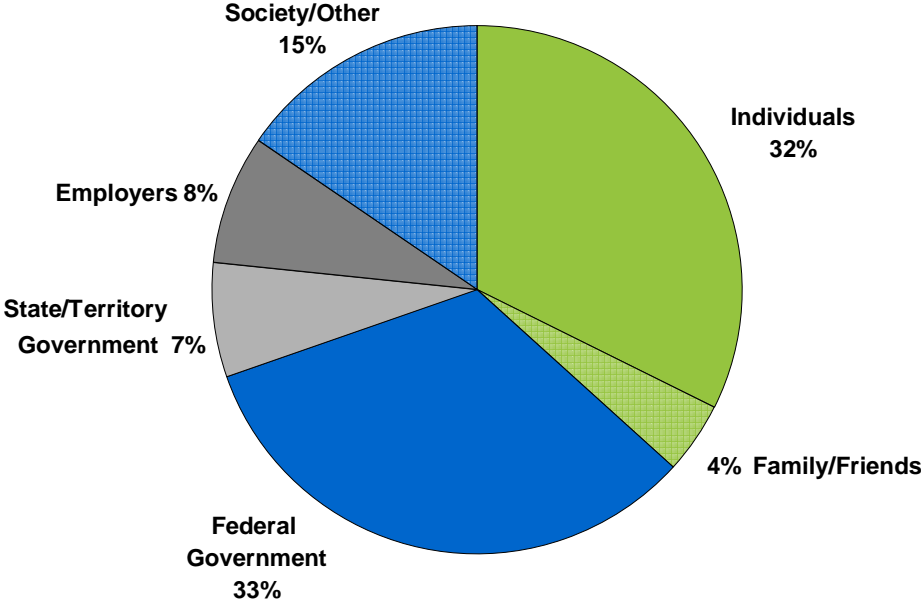
The largest share of chronic pain costs is borne by the individuals with chronic pain themselves who, principally due to the large BoD costs, bear 55% of total costs; 22% of total costs are borne by the Federal Government, due primarily to their share of health system and productivity costs. Employers bear 5%, State Governments 5%, family and friends bear 3%, while the remaining 10% is borne by society.

Figure 6-2: Total Costs of Chronic Pain by Bearer, 2007



If just the financial costs are considered, the relative shares by bearer are shown in Figure 6-3, with Federal Government bearing the largest share (33%), closely followed by individuals (32%).

Figure 6-3: Financial Costs of Chronic Pain by Bearer, 2007



Note: numbers may not sum to 100% due to rounding.

7. COST EFFECTIVE INTERVENTIONS AND STRATEGIC DIRECTIONS

This section makes comparisons with other conditions, and describes some cost effective interventions for preventing and managing chronic pain. Comparisons can be useful where relative prioritisation is important in strategic planning for future health budgeting and research, including relative to total health expenditure and gross domestic product.

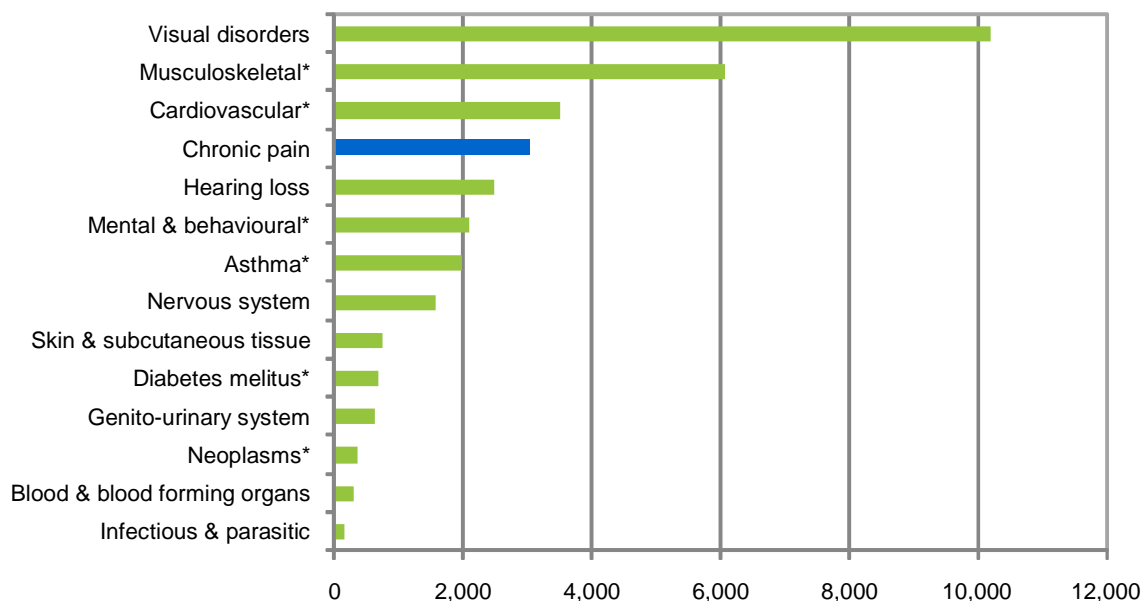
7.1 COMPARISONS

7.1.1 Prevalence

2005 is the most recent year for which comparable prevalence data on all diseases are available and Figure 7-1 below depicts the prevalence of chronic pain relative to selected other conditions. In 2005, chronic pain prevalence was comparable or higher than a number of National Health Priority Area (NHPA) conditions including mental and behavioural disorders, asthma and diabetes.

- The prevalence of chronic pain in 2005 is estimated at around 3 million people.

Figure 7-1: Prevalence Comparisons – Chronic Pain and Other Conditions, 2005



Prevalence (thousands of people).
* National health priorities.

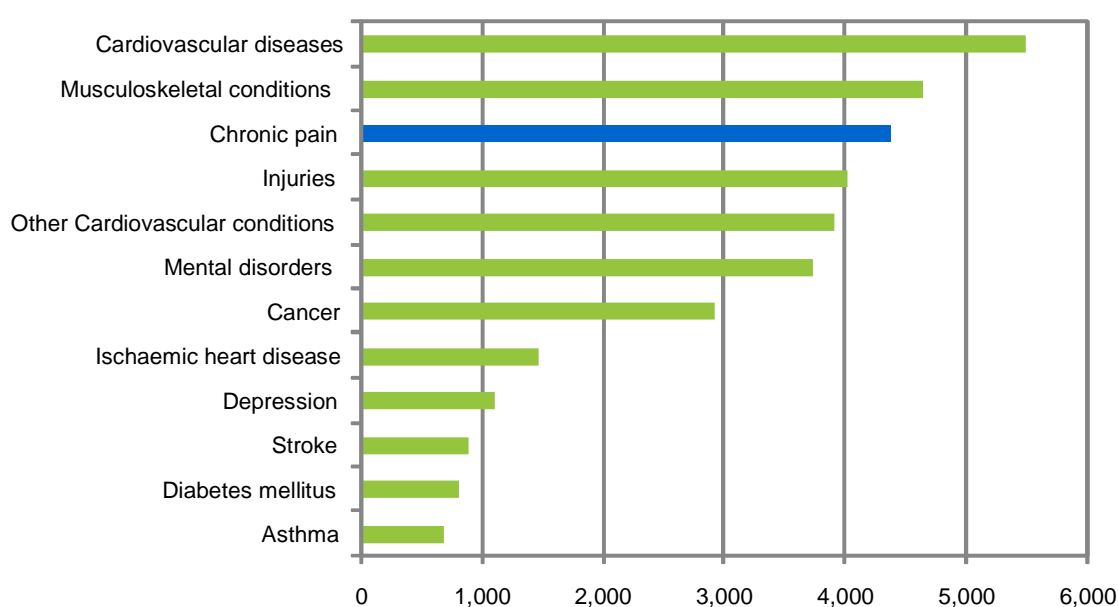
Source: Access Economics based on ABS NHS 2004-05.

Note: Chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

7.1.2 Health Expenditure

The most recent comparable data across diseases for health expenditure in Australia are for the year 2000-01, contained in the AIHW publication *Expenditure on Disease and Injury in Australia* (AIHW 2005) (Figure 7-2).

Figure 7-2: Health Expenditure Comparisons, Chronic Pain and Other Conditions, 2000-01 (\$ Million)



Source: Access Economics based on AIHW (2005).

Note: Chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

Allocated health expenditure on chronic pain was estimated as around \$4.4 billion in 2000-01 – the most recent year for which there are comparable health expenditure data across diseases. This was third only to cardiovascular diseases and musculoskeletal conditions among the NHPAs, while noting the overlap between costs of chronic pain and its underlying causes.

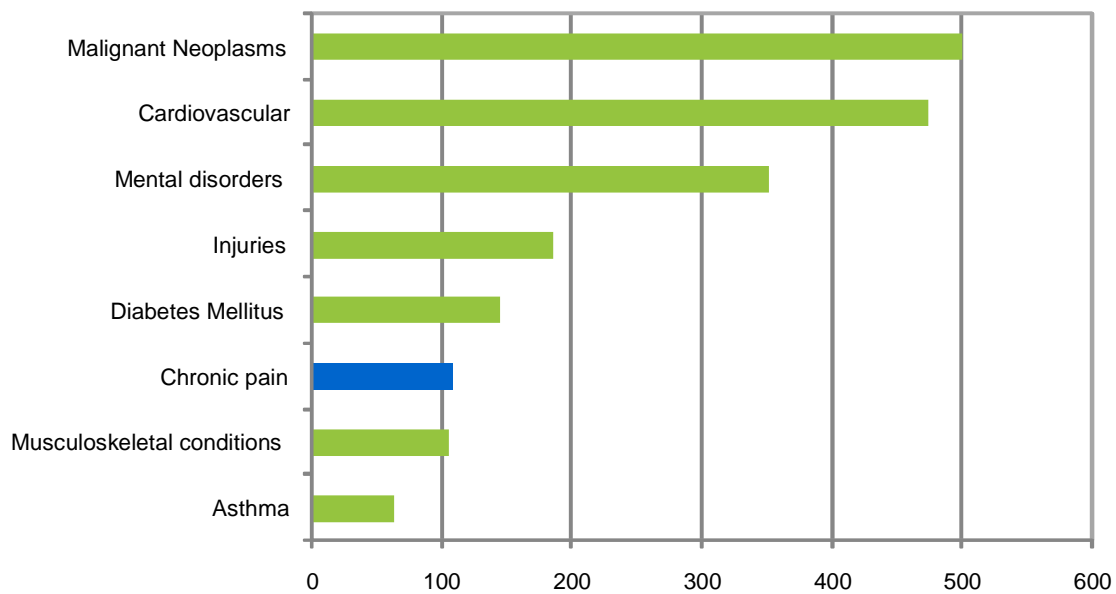
- This outcome is consistent with the prevalence and impact of chronic pain and means estimated spending on chronic pain ranks highly relative to many of the NHPAs – outstripping allocated health spending on conditions such as injuries and mental disorders.

7.1.3 Burden of Disease

The most recent data available comparing the BoD from different conditions in Australia is the recent AIHW publication relating to the year 2003 (Begg et al, 2007).

- According to the findings of this report, the BoD of chronic pain in 2003 was comparable to that of diabetes and of musculoskeletal conditions, and ranked higher than asthma, which is a NHPA (Figure 7-3).

Figure 7-3: BoD In 2003, DALYs ('000)



Source: Access Economics (2007) and Begg et al (2007).

Note: Chronic pain, in addition to being a condition in its own right, is also an important component of NHPA conditions, for example cancer, musculoskeletal diseases and injuries.

7.1.4 Total Costs

Comparing the total costs of chronic pain with other conditions is hampered by the fact that there are few disease cost burden analyses published in Australia. Presented in Table 7-1 is a comparison of the total costs of a number of conditions, as estimated by Access Economics in recent studies. While direct comparison between studies is not possible due to the different base years used, Table 7-1 does provide an insight into the significant size of the costs associated with chronic pain in Australia.

Table 7-1: Total Cost Comparisons (\$ Billion)

Year of study	Condition	Financial costs	\$BoD	Total cost (current \$)
2007	Chronic pain	22.8	11.5	34.3
2007	Arthritis	12.2	11.7	23.9
2007	GORD & PUD [^]	9.7	7.2	16.9
2005	Hearing loss	11.7	11.3	23.0
2005	Cancer	11.2	83.4	94.6
2004	Cardiovascular disease	14.2	93.9	109.1
2004	Vision loss	5.0	4.8	9.9
2004	Restless legs syndrome	1.4	9.7	11.1
2004	Sleep Disorders*	6.2	4.1	10.3
2003	Bipolar disorder	1.6	n/a	n/a
2002	Dementia	6.6	n/a	n/a
2002	Schizophrenia	1.8	n/a	n/a
2001	Osteoporosis	7.5	n/a	n/a

Source: Past Access Economics reports.

[^]Gastro-oesophageal reflux disease and peptic ulcer disease.

* Obstructive sleep apnoea, insomnia, periodic limb movement disorder and narcolepsy.

7.2 COST EFFECTIVE INTERVENTIONS

The results from this report and previous research indicate that chronic pain has a significant impact on health spending as well as the economy as a whole. This impact is likely to increase as the population ages over the coming decades.

As medical technology advances, patient care and treatment is changing in many ways. However, unlike technological change in other industries, which is often cost-reducing, many technological advances in health result in increased costs (eg. new large molecule pharmaceuticals, greater use of newer diagnostic procedures). Demographic ageing is another cost driver, with health costs per person much higher in older age. Finally, health is an income-elastic good, which means that as the standard of living increases over time, Australians spend a higher proportion of household income on health, with higher expectations of the quality of care.

- These future spending pressures were reaffirmed in the Australian Government's *Intergenerational Report 2007*, which outlined that Commonwealth spending on health is projected to grow significantly over the next 40 years increasing as a proportion of GDP from 3.8% in 2006-07 to 7.3% in 2046-47.

Given the projected financial pressures, spending on health, like any form of expenditure, is likely to be subject to a binding budget constraint and this limits both the quality and the quantity of health services that can be provided, in particular through publicly financed mechanisms. In this context, evaluating and comparing health interventions in terms of their ability to achieve their ultimate goal – effective, efficient improvements in quality of life – is vital to ensuring efficient allocation of these scarce resources.

Cost effectiveness analysis is used to assess and compare the value of interventions in terms of their ability to provide health and other benefits, relative to the cost of the intervention. The most common type of cost effectiveness analysis in health is cost utility analysis, which compares the net financial cost of the intervention with the wellbeing benefit, measured in dollars spent per QALY gained (ie, \$/QALY). Expensive treatments can be cost effective if they confer significant value to a person in terms of longevity and quality of life. Conversely, expensive treatments are not cost effective if they offer only small wellbeing gains relative to their costs.

- If an intervention reduces overall financial costs and gains QALYs, it is called **cost saving** – for example, an intervention that enhanced activities of daily living to such an extent that entry to nursing home care is delayed or averted.
- **Dominated** interventions, on the other hand, are both more costly and less effective than the comparator (the alternative being analysed).

There is a variety of opinion on where bounds for cost effective interventions lie and, furthermore, no common thinking has emerged on thresholds for incremental cost effectiveness ratios that might be used in public reimbursement decision-making processes.

7.2.1 Economic Evaluation Literature on Chronic Pain Treatments

The economic evaluation literature on chronic pain treatments is in urgent need of further development. Economic evaluations of community-wide and primary care-based treatments are needed, given the size of the problem of chronic pain in the Australian community.

There are few published analyses of the economic impact of chronic pain treatments and most of these are related to MPCs or their components. Recent expert review of treatments for chronic non-specific low back pain (eg. Assendelft et al, 2004) was unable to locate cost effectiveness studies for many of the treatment modalities used in this significant chronic pain population group.

However, a more useful perspective in this context may be to consider the related concept of cost-benefits of pain treatments. It should also be recognised that, as much of persistent pain is currently intractable to curative interventions, effectiveness should be gauged not from complete pain relief, but rather minimising impact of persisting pain on a person's lifestyle (quality of life), restoration of functional activities of daily life, and reduced use of health services.

7.2.1.1 Cost-Benefits⁹

There is evidence that for the types of patients concerned (i.e. the more disabled, medication-dependent and higher consumers of health care services), MPCs can offer cost-benefit advantages over other forms of care.

The Audit Commission report (2003) on Anaesthesia Services in the UK included a case study of one MPC. The main findings indicated that the number of consultations with other specialists, particularly surgeons, did drop significantly in the 6 months following attendance at the MPC, relative to the 6-month period before the MPC. Overall, the findings indicated that the MPC covered its costs by reducing consumption elsewhere within the local health system and there were cost savings achieved through fewer GP consultations. Patients also sought fewer private treatments following attendance at the MPC.

In a review of the Oxford Regional Pain Relief Unit (UK), McQuay et al (1997) considered the disease burden represented by the conditions typically seen in MPCs, estimating the probable levels of change achieved and assessing whether MPCs added to costs (to the health system) or reduced them. Extrapolating from some Canadian data, McQuay et al concluded that in 1 year 'the use of MPCs results in direct health service savings equal to twice their cost' (pp. 113).

More recently, Gatchel and Okifuji (2006) examined a number of published studies that had evaluated the clinical effectiveness of common pain treatments and calculated their cost effectiveness in relation to the costs incurred in returning a patient to work. While acknowledging the inherent methodological difficulties in his investigation, Turk (2002a) concluded that multidisciplinary pain rehabilitation programs achieved significantly better outcomes on a range of dimensions than other pain treatment modalities. The outcomes for which these programs were superior to other modalities studied included medication use, health care utilisation, functional activities, return to work, closure of disability claims and substantially fewer iatrogenic consequences and adverse events. He also found that surgery, spinal cord stimulators and implanted drug delivery systems (IDDS) achieved substantial benefits for selected patients, but they were also the most expensive options. Overall, Turk (2002a) concluded that multidisciplinary pain rehabilitation programs are significantly more cost effective than spinal cord stimulators, IDDS, conservative care and surgery, even for selected cases. However, Molloy et al (2006) did show that improved functional outcomes could be achieved when a multidisciplinary program was combined with either an IDDS or SCS for the most disabled cases.

7.2.2 Summary of Chronic Pain Interventions

Appendix 2 provides examples of recent studies of the cost effectiveness of different treatment modalities for chronic pain, where such studies exist. By comparing this with the preceding sections, it becomes apparent that there are many gaps in the cost effectiveness literature for chronic pain treatments. The complexities of Australian federal-state health funding mechanisms and differences in health care delivery systems between countries suggest that Australian-based economic evaluation studies are required.

⁹ The material for the following section was largely derived from Nicholas (2004).

7.3 STRATEGIC DIRECTIONS AND CHALLENGES

This report shows that chronic pain is a surprisingly common condition in Australia and has a substantial economic impact on society due to its prevalence and the various widespread impacts on people who experience it and those caring for them. This, as well as the relationship between chronic pain and socioeconomic disadvantage, makes it an important public health concern in Australia. However, there are relatively few Australian data on the prevalence of chronic pain, its progression, and its impact on individuals and health services and the broader community.

There is a growing emphasis on developing multidisciplinary management strategies for chronic illnesses such as chronic pain. In response to a demonstrated need, five medical specialties (Anaesthesia, Medicine, Psychiatry, Surgery, and Rehabilitation Medicine) co-operated in the formation of a multidisciplinary Faculty of Pain Medicine (FPM) housed in the Australian and New Zealand College of Anaesthetists (ANZCA). The FPM Board includes representatives of all five specialties – a unique body internationally. The Board oversees a single training program and examination in Pain Medicine, approved by the Australian Medical Council (AMC). In 2005 Pain Medicine was approved as an independent medical specialty. There is an apparent major shortage of Pain Medicine specialists relative to demand, and a lack of funding for training positions and of resources (funding and staff) for MPCs.

7.3.1 Research Challenges

Chronic pain is a complex multidimensional phenomenon. The current report has collected the available data on epidemiology in order to estimate the economic impact. However, there are a number of areas where data are nonexistent or data quality could be improved.

- There is a lack of data on the prevalence of chronic pain in children (between the ages of 0-14 years). While the experience of experts in the field suggests that chronic pain in children is at least as prevalent as that experienced by adults, the lack of survey data makes the impact difficult to estimate.
- More research is required on the progression from acute to chronic pain and from non-disabling chronic pain to disabling chronic pain.
- There is a lack of data on mortality (including suicide) associated with chronic pain – particularly for Australia.
- There is a lack of data on chronic post-surgical pain in Australia.
- There is a lack of data on assessment and management of pain in older people, especially those with cognitive impairment.
- Because so much chronic pain is currently difficult to identify, it can also be difficult to apportion the health and other costs due to chronic pain. An AFs approach was taken in this report to estimate health system costs. However, a more detailed and direct analysis of health costs would be beneficial, controlling for other factors. This would also assist in relation to the BoD calculations, where there is also need for better estimation of disability weights for chronic pain, including by severity.
- There are few Australian data on cost effectiveness of commonly used interventions for chronic pain, at the individual, systems (eg. workplace) or community level.
- There is a need for more research on the impact of chronic pain on productivity through sickness presenteeism.

- These issues point to the need for an integrated strategic research strategy, which could then be used to better inform health system effects and other elements of the impact and management of chronic pain.

7.3.2 Employment Impact

This report outlines that chronic pain has a significant impact on a person's ability to work effectively or at all. This imposes real costs on the Australian economy, which is already running at near full employment and can ill afford to lose productive capacity.

There are a number of factors that have the potential to inhibit the recruitment and retention of people with chronic pain, and their ability to work at optimal productivity levels, including the following.

- Current employment support programs in Australia for people with disabilities tend not to emphasise retention and protection of existing jobs (rather, finding 'new' jobs for the unemployed).
- There can be poor workplace adaptation and job redesign (including the selective use of adaptive technology) which, in turn, limits workplace access for individuals with chronic pain and can lead to the loss of workers as people are forced out of work prematurely.
- There may be poor information and support for employees and employers about working with chronic pain, and stigma (especially if the cause of the pain is not known).
- There is a potential for workplace discrimination once the chronic pain becomes known, forcing the problem underground and potentially increasing the size of the problem in the future both for the employee and the employer.
- Once a job has been lost, finding alternative employment that will accommodate chronic conditions such as pain can be problematic. Many prospective employers require details of pre-existing disabilities with consequent reluctance to take on those whose capacity to perform a full range of employment duties is doubted.
- Employers may also have concerns about workers compensation liability in the case of hiring workers with a chronic illness. Accordingly, many people with chronic pain can have fractured working lives or are unable to maximise their earning capabilities by not being able to advance their employment status or by being limited in overtime capacity. An additional obstacle for people with chronic pain can be the additional time, effort and cost commuting to work, negotiating traffic or public transport.

A key challenge is in introducing seamless employment support programs that involve innovative strategies such as workplace environment adaptation, job restructuring or tailoring, part-time and flexible work-from-home options, and transport assistance, as appropriate. Workers compensation 'return to work' or rehabilitation models may be useful – these can determine work capacity on an individual basis. Incentive regimes are also possible that recognise efforts made by both parties in adapting and maintaining employment arrangements.

Research indicates that interventions that target working with appropriate pain management, together with other support such as job flexibility, could significantly reduce lost productivity costs due to chronic pain.

7.3.3 Awareness and Early Intervention

The section above suggests that early assessment and intervention should be encouraged where reports of pain are limiting the ability of Australians to return to work. This could help avoid unnecessary suffering, increasing disability, and associated legal and other costs (Molloy et al, 1999).

This process could be facilitated through awareness and education of both people with chronic pain and society as a whole (eg. medical practitioners, employers, and carers). In the workplace context, these strategies are needed to counter workplace misperceptions and discrimination against people with chronic pain, and that induce cultural change among employers and employees to identify and implement positive long term solutions. These should cultivate 'success factors', namely:

- a positive relationship between employee and employer;
- basic employer knowledge of chronic pain (including the impact of invisible symptoms) and sensitivity to the employee's needs;
- worker's knowledge of employment rights frameworks such as discrimination and Equal Opportunity legislation;
- options for workplace and job modification/flexibility, including working from home and being able to work outside normal hours;
- effective management of symptoms to reduce presenteeism and facilitate longevity in work; and
- availability of responsive support services into workplaces to assist in workplace accommodation, information provision and disclosure issues.

7.3.4 Continuity and Quality of Care

Challenges in ensuring the quality of care for people with chronic pain and other chronic illnesses can include:

- skilled workforce shortages in medical specialties (particularly Pain Medicine), allied health, community health and general practice, particularly in certain areas;
- insufficient appropriate education and training in the formal health care sector and lack of awareness in relation to chronic pain; and
- the need for a special type of carer who has the training and capacity to cope with chronic and sometimes progressive illness, compared to acute illness with a 'cure'.

Given that the majority of care for people with chronic pain tends to occur in the informal context, appropriate support is also required for informal carers.

Adequate ongoing funding injections are required to increase services to carers, in particular for education, peer support and respite. Access Economics (2003) showed that some programs that provide these services to carers can have seven-fold returns in terms of improving the quality of life of carers and the people they care for and delaying costly institutionalisations.

7.3.5 Disadvantaged Groups

Given the link between chronic pain and lower SES, attention needs to be paid to disadvantaged groups.

- This includes people from rural and regional areas, where access to medical services and workforce adequacy (notably medical) is poorest. Smarter use of new information technologies can assist in delivering health and support services to people in rural and remote areas, including web-based information resources and messaging, moderated chats and forums, videoconferencing and clinical communications.
- An emerging issue is the special needs of people from culturally and linguistically diverse backgrounds. People from non-English speaking backgrounds can face added challenges in relation to identifying chronic pain, language barriers (eg. translation of information and support materials), employment obstacles, culturally appropriate services, and individual customs, traditions and values. These Australians have equal right to access affordable, quality chronic pain assessment and care services, which can only be available for them if specialist resources are developed to promote access.

7.3.6 Collaboration

Chronic pain is a diverse condition often requiring treatment from a range of health care professionals, including medical specialists required to be knowledgeable about the management of challenging pain problems in paediatric, adult and geriatric patients across a wide medical specialty field.

Furthermore, there is an overlap between pain medicine and other medical fields, including rehabilitation, palliative care and occupational health.

The recognition of chronic pain as a complex multidimensional phenomenon has focussed attention on limiting a poorly coordinated uni-dimensional approach to assessment and treatment, which is less effective and more costly than multidimensional treatment.

- As outlined above, there is substantial evidence that a multidimensional pain management approach covering a range of medical specialties can reduce financial costs. It can also return individuals to work who would otherwise be unemployed or not participating in the workforce.

7.3.7 Multidisciplinary Pain Management

The discussion in this section outlines a number of challenges for the management of chronic pain and indicates that the condition can be best managed in a collaborative and multidisciplinary fashion. Improved outcomes will require appropriately trained health professionals to assess and treat the broad range of problems in patients with chronic pain.

While the majority of people with chronic pain should be managed effectively by coordinated services at the community level, a proportion will require the resources of multidisciplinary pain management centres. These centres utilise the services of a range of health professionals to assess the multidimensional aspects of pain and to design appropriate programs of treatment aimed at control of pain, including rehabilitation and improvements in functional outcomes.

- Timely multi-dimensional assessment, management, and triage in primary care settings with early referral for multi-disciplinary pain assessment (if required) is needed.
- The emphasis is on coordinated, multi-disciplinary/dimensional care: in many cases, no single treatment is likely to be enough. If more than one treatment provider is involved, a coordinated (and consistent) treatment plan is essential.

- For those people with chronic, disabling pain the best evidence available (and broad consensus by experts in the field) is that a collaborative and multidisciplinary approach to management is likely to help most.
- There is wide variability in pain clinics, according to resources, staffing and types of services offered. As a result it is suggested that a term like MPC may be preferred as it conveys a sense of multiple services.
- Multidisciplinary pain management centres represent a major resource for the assessment/treatment of patients with complex and disabling pain, the training of all health professionals in this work, research into persisting pain, and public education about chronic pain and its management.
- However, most patients with chronic pain should be managed at the local community level (by different health care providers working collaboratively, as required).
- This approach requires integrated outpatient and inpatient programs, which are difficult to implement in the current health care financing system.

APPENDIX 1: CHRONIC PAIN MANAGEMENT – SUMMARY OF EVIDENCE

This table applies to the management of chronic pain not the treatment of specific conditions, such as cancer or arthritis but, rather, where the pain has been present daily for more than three months since onset and the focus of treatments is the relief or control of pain as well as limiting its impact on the person’s functional activities (reducing disability)

Key:

Effects: 0 = no effect; + = some benefit; ++ = medium benefit; +++ = marked benefit; - = adverse effect; ? = unknown or conflicting

Level of Evidence as defined by the Cochrane Back Group:

Strong:	+++	Consistent findings among multiple high quality RCTs**
Moderate:	++	Consistent findings among multiple low quality RCTs and/or CCTs and/or one high quality RCT
Limited:	+	One low quality RCT and/or CCT
Conflicting:	C	Inconsistent findings among multiple trials (RCTs and/or CCTs)
No evidence from trials:	0	No RCTs or CCTs

** There is consensus among experts that strong evidence can only be provided by multiple high quality trials that replicate the findings of other researchers in other settings.

RCT: Randomized Controlled Trials (generally considered the strongest level of evidence for a treatment)

CCT: Case Controlled Trials (when RCTs may not be feasible, can provide next strongest level of evidence)

Type of Treatment	Condition/ Pain site/ general	Effect on symptoms (pain)	Level of evidence	Effect on function / disability	Level of evidence	Comments (eg duration of treatment / ongoing treatment, cost, other factors) (refs)
Pharmacological						
Opioid analgesics - overall - 'weak' opioids - 'strong' opioids	Mainly nociceptive/ 'mechanical' pain	+	++	?	+	<p>Overall, if these drugs are used, they must be part of a plan with functional goals; the goal must not be just pain relief. None of these drugs should be expected to relieve pain completely. The patient is expected to use the drugs in a consistent way (as prescribed) while upgrading activity levels. Medical supervision and regular review of progress is essential. If functional goals are not being achieved with these drugs, investigation and a revised plan is recommended.</p> <p>Opioids may be considered if not responding to <u>adequate</u> trials of other interventions. Regular (daily) dose should be used and use should not be based on symptom flare. Note: Opioids are often used (incorrectly) for depression and anxiety in chronic pain patients, so comprehensive assessment of case is essential before prescription (Sullivan et al. (2005); Moore & McQuay (2005): identified adverse events a problem for 1/5 patients. Further discussion see Nicholas et al. (2006);Ballantyne & Mao (2003).</p> <p>Duration of antidepressants treatment to be clarified. Long-term use uncertain. Usually lower doses than for primary depression (can help with sleep and pain). Amitriptyline usually better than newer SSRIs. (Coluzzi & Mattia (2005); Saarto & Wiffen (2005).</p> <p>With sedatives, potential for harm from sedation and dependency to be considered. No evidence for improved function with sedatives.</p> <p>Anticonvulsants are generally useful with neuropathic pain.</p>
Tramadol (synthetic opioid)	General	+	+	?	+	
Antidepressants	General	+	++	?	++	
Sedatives	General	+	+	?	+	
Anticonvulsants	Neuropathic	++	++	?	++	

						but some don't like side effects, and not everyone responds. Wiffen et al. (2005). Carbamazepine, Gabapentin and recently, Pregabalin are common agents here.
Antiarrhythmics	Neuropathic pain	?	0	?	0	Mexilitine is sometimes used but side-effects often not tolerated. No RCTs found.
Nonsteroidal anti-inflammatory drugs (NSAIDs)	Nociceptive/inflammatory conditions	+	+++	+	++	Long-term effectiveness after 3 months not clear
Paracetamol	Nociceptive/mechanical pain	+	+++	+	+	Long-term effectiveness after 3 to 6 months not clear
Capsaicin (topical)	Neuropathic pain	+	+++ (for short term use)	?		(Airaksinen et al., 2005; L1)
Interventional						Note potential for significant harm for all treatments in this group.
Nerve blocks	Nociceptive pain		C	?		Nerve blocks really for diagnostic purposes in chronic pain, not an ongoing treatment. Short-term effects expected only (hours) (Airaksinen et al., 2005; L1)
Epidural steroid injections	General		C	?		Epidural steroids (transforaminal) for radicular pain – limited (lumbar) (Airaksinen et al., 2005; L1)
Facet joint injections (either intra-articular or medial branch)	Spinal pain (diagnostic)		C	?		Facet (zygapophyseal) joint injections, usually directed at the medial branch nerves (MB Blocks), are used to determine if spinal pain in that region can be blocked. Usually tried in a double-blinded way with a placebo-control or a second agent for comparison. If considered a 'positive' result it provides a justification for proceeding to a more lasting intervention on the nerve (radiofrequency lesioning).

Radiofrequency lesioning	Spinal pain (only when MBBs show clear effect)	+ (neck) ? (back)	+ (neck) C (back)	+ ?	C C	But research studies show best results are achieved when the pain relief from MBB is 100%. Most clinics use much lower results (eg. 50%) and may not get the same effects as in research studies. (Airaksinen et al., 2005; L1) Patient selection a critical issue. If effective can relieve most spinal pain for periods of up to 9-months, when nerve regrows and pain returns. RFL can be repeated but many patients do not like the procedure and decline repeats. It is not known how many times it can be repeated safely. Recent systematic review: Hoving et al. Radiofrequency Neurotomy as Treatment for Spinal Joint Pain: A Systematic Review of the Literature (see MAA website). (Airaksinen et al., 2005; L1)
Electrothermal Denervation (includes Intradiscal Radiofrequency Thermocoagulation (IRFT) and Intradiscal Electrothermal Therapy (IDET))	Spinal pain	0/+	+/C	?	?	Conflicting results, not recommended for either non-specific or "discogenic" low back pain (LBP). (Airaksinen et al., 2005).
Intrathecal drug delivery systems (IDDS)	Spinal pain/neuropathic/failed back surgery	0	0	?	?	Ongoing requirement for tank refills (often every 4-6 weeks). No RCTs of IDDS, case series only
	Cancer-related pain	+	+	+	+	Smith et al J Clin Oncol 2002;20:4040-49
Spinal cord stimulators (SCS)	Spinal pain (failed back surgery)	+	++	?	?	SCS is more effective than re-operation as a treatment for persistent radicular pain after lumbosacral spine surgery, and in the great majority of patients, it obviates the need for re-operation (Kumar et al, 2002; North et al. Neurosurgery

Spinal cord stimulators (SCS) (contd)	CRPS	++	++	++		56:98-107, 2005), but activities of daily living and work status, no change. Two small RCTs only, plus case series. Not recommended for non-specific pain.
Deep brain stimulation	Spinal pain	0	C	0	+	SCS effective for selected patients with severe CRPS (Mekhail et al, 2004; Taylor et al 2006) No large RCTs of DBS, mostly only case studies. Not recommended for non-specific pain.
Motor Cortex stimulation	Neuropathic, central pain	+	+	0	+	No large RCTs of MCS, only small studies and case series (Coffey & Lozano, 2006)
Prolotherapy	Spinal pain	0	C	?		Local injections with sclerosants in the ligaments of the back. Note evidence of lack of effectiveness in chronic back pain (Airaksinen et al., 2005).
Intradiscal injections	Spinal pain	0	+	0	+	(glucocorticoid or glycerol) Moderate evidence of lack of effect (Airakinsen et al., 2005)
Intramuscular Botulinum toxin		0/+	C	?		Evidence of lack of effect in neck pain (Peloso, 2006); one RCT in LBP (Foster, 2001). Not recommended by Airakinsen et al. (2005) for LBP.
Trigger point injections		0/+	C	?		Only short-term benefits .Airakinsen et al. (2005)
Surgery						Surgery for non-specific CLBP cannot be recommended unless 2 years of all other recommended conservative

Spinal fusion	Spinal pain	+ / -	C			treatment (inclusive multidisciplinary approaches with combined programs of cognitive intervention and exercises) have failed, or such combined programs are not available, and only then in carefully selected patients. Generally, surgery is not indicated for chronic pain but rather for surgically correctable anatomical feature, that may be contributing to pain. (Airaksinen et al., 2005; L1)
Other surgery		+ / -	C			
Stimulation						
TENS	In general, LBP, neck pain, limb pain	+ / o	C	?	C	TENS : Inconsistent evidence, (Khadilkar et al. (2005). No evidence for use as sole tmt. For neck pain, TENS evidence limited, lacking or inconsistent. Kroeling P, et al. (2005).
Acupuncture		+ / o	++	?	C	For chronic low back pain: The use of acupuncture, TENS, heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets) cannot be recommended. (Airaksinen et al., 2005; L1).
Neuroreflexotherapy		+	++	?	?	Neuroreflexotherapy only 3 RCTs (all in Spain) not confirmed elsewhere.
Percutaneous electrical nerve stimulation		+	++	?	?	Some RCT evidence for use of PENS in uncomplicated cases (North et al., 2005). (Airaksinen et al., 2005), particularly occipital neuralgia and post-operative neuralgia
Exercise Therapies (usually gradually)	LBP, neck pain, shoulder pain, generalised pain	+	+++ / +	+	+++ / +	Type of exercise: unclear which is best (inconsistent or insufficient evidence) For functional goals: Generally more effective with CBT included. For functional goals: Effects moderate, but better than manual, electrical, drug treatments, GP advice. Neck pain effects better when combined with mobilization/manipulation. (Kay et al, 2005) Return to functional activities needs to be specified as goal, vs 'fitness' Return to work: fitness alone not enough; need to identify &

increased in demands)						deal with barriers (likely to be better with additional measures) Schonstein et al. (2003) Cochrane review: best functional and RTW outcomes when exercise program includes CBT (see below). Koes et al. (2006) ; Airaksinen et al., (2005; L1)
Physical therapies						
Traction	LBP, neck pain,	0	+++	?		Traction: no effect for LBP (Clarke et al., 2005, L I)
Laser	LBP/ neck pain, generalised pain	0	C	?		(Airaksinen et al., 2005; L1)
Ultrasound		0	0	?		(Airaksinen et al., 2005; L1)
Short wave diathermy & interferential	LBP	?	0	?		(Airaksinen et al., 2005; L1)
Corsets	LBP	0	0	?	+++	(Airaksinen et al., 2005; L1)
Massage	Neck pain LBP	0	+++	0	++ ++	Massage no effect for LBP (Ernst et al., 1999, L I) (Airaksinen et al., 2005; L1)
Mobilisation & manipulation	Neck pain LBP	+ +	+++ +++	0/+ 0/+	C C	Manipulation: some effect for acute neck pain, but may not be superior to TENS (Vernon et al., 2005). Manips + exercise effect on LBP pain, not function (Geisser et al., 2005; L3). Manips alone no benefit over general practitioner care, analgesics, physical therapy, exercises, or back school. (Assendelft et al., 2004).

						Osteopathic Manipulation: symptom effect for LBP up to 3-mnths (Licciardone et al., 2005). Combination of manips/exercise/ advice small benefit over GP advice (Niemisto et al, 2005; L3) Systematic reviews unable to distinguish between mobilization and manipulation. (Airaksinen et al., 2005; L1) Short-term use only, not ongoing (Airaksinen et al., 2005)
Hot/cold treatments	LBP	?		?		No evidence for chronic LBP, Moderate evidence for acute/sub-acute LBP, esp if combined with exercise. French et al. (2006).
Education (back schools)	LBP	+	+++	+	+++	Problem with definition – many interventions called ‘back schools’. Some a few hrs of information, others include multi-sessions with exercises, coping strategies, home rehab. Need to check content. Heymans et al. (2005): Moderate evidence suggesting that back schools, in an occupational setting, reduce pain and improve function and return-to-work status, in the short- and intermediate-term, compared with exercises, manipulation, myofascial therapy, advice, placebo, or waiting list controls, for patients with chronic and recurrent LBP. The more effective Back schools in this review had many activity components, not just education/advice. These included cognitive-behavioural interventions, exercises, advice. More like multi-disciplinary pain management programs (see below). Airaksinen et al., (2005): in low disability cases 1 session of education may be useful, but high disability cases need more extensive approaches.
Specific Psychological treatments	In general, pain site not important					
Hypnosis	General cp (pain	+	+	?	0	Short-term pain reduction effect similar to relax/autogenic

	site not important)					training > PT; education. Jensen & Paterson (2006). Not recommended by itself, but may be included as part of a self-management approach.
Biofeedback/ Relaxation/ Meditation	General cp (pain site not important)	+	+++	?	+++	<p>Typically biofeedback has been provided with relaxation training. Biofeedback has been used more with headaches and TMJ pain, but some use with LBP.</p> <p>Relaxation training, hypnosis and meditation have similar effects on pain reduction, but are not generally enough (alone) to achieve functional gains or RTW.</p> <p>NIH Technology Assessment Panel on Integration of Behavioral and Relaxation Approaches into the Treatment of Chronic Pain and Insomnia (1996). McQuay et al.(1997).</p>
Psychodynamic therapies/ Non-specific counselling.	General cp (pain site not important)	?	0	?	0	<p>Insufficient evidence for pain management. Only case studies and no RCTs reported. Requires research. Not recommended for pain management specifically.</p> <p>Clinically, these approaches may have a place as an element (among other interventions) in the management of patients with long-term, pre-existing (ie. pre- injury) psychological/personality (often inter-personal) problems.</p> <p>As with any psychological treatment, the patient does need to form a 'therapeutic alliance' with the psychotherapist with agreed goals or purpose. (see Roth & Fonagy, 2005).</p>
Cognitive-behavioural	General CP (pain site not important)	+	+++	++	+++	When done by well-qualified psychologists or psychiatrists (trained and experienced in pain management) there is good evidence for this group of interventions for pain management

<p>treatments</p>					<p>as well as management of associated mood disorders (eg. anxiety, PTSD, adjustment, depression).</p> <p>For pain management, components usually include goal setting, structured plans for working towards achieving specific goals, activity pacing, problem-solving, thought management (to deal with unhelpful thoughts/beliefs), and relaxation training/meditation. These interventions have an emphasis on self-reliance and practice of pain management strategies (eg. activity pacing, relaxation, problem-solving etc.) at home and work with structured 'homework' plans. <u>Must</u> involve more than talking/counselling with the psychologist/psychiatrist.</p> <p>Note: these treatments are operator dependent, so practitioners with no specific training and experience in pain management are less likely to be effective. Nielson & Weir (2001); Morley et al. (1999). For LBP: Koes et al. (2006); Airaksinen et al., (2005; L1) state: CBT may be one treatment of choice.</p>
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<p>Multi-disciplinary pain management programs (in groups) (using CBT methods)</p>	<p>General CP (pain site not important)</p>	<p>+</p>	<p>+++</p>	<p>++</p>	<p>+++</p>	<p>Typically include clinical psychologists, physiotherapists, nurses, medical practitioners and occupational therapists who work as a coordinated team. Disciplines may vary, but typically a clinical psychologist and a physiotherapist are key team members.</p> <p>Must use CBT as core principles underlying all aspects of program. Content includes CBT elements outlined above, plus a structured exercise program (usually strength, fitness, stretch exercises), medication rationalisation and withdrawal.</p> <p>Effectiveness of treatment depends in part upon staff training/experience and selection of patients for the right program. Patients with high disability, mood disturbance, medication dependence are best suited for an intensive program (100-120 hrs over 3-4 weeks) with pre-admission preparation and follow-up sessions. Patients with only moderate disability will do as well in less intensive programs (30-70 hrs over 4-6 weeks).</p> <p>McQuay et al. (1997). Morley et al. (1999) Pain. 80:1-13 Guzman et al., (2001) BMJ 322, 1511-1515.</p> <p>Haldorsen et al. Pain 2002; 95: 49-63. Airaksinen et al., (2005; L1) : High disability cases with LBP likely to need more extensive interventions.</p>
<p>Multi-disciplinary pain management programs (with individuals, one on one) (using CBT methods)</p>	<p>General CP (pain site not important)</p>	<p>?</p>	<p>0</p>	<p>?</p>	<p>0</p>	<p>No good evidence (only case series) and no RCTs. But, extrapolating from group-based programs (above) may be justified <u>providing</u> key features of group programs can be achieved – eg. use of practitioners from same disciplines as above, with training & experience in pain management, working in closely coordinated way to ensure consistency. Content of intervention should mirror methods used in group programs (with emphasis on applying CBT to activity upgrades, mood/adjustment problems). Patients would need to be seen often (depending upon practicalities of attendance,</p>

						but at least weekly) for at least 25-30 hrs over 8-12 weeks. Content must be same as for group programs (see above) and must involve practice of strategies/exercises/activities outside session times (in structured way) at home & work. As for group programs, intensity (time & contact) should depend upon nature of case, with more distressed, disabled case seen more often and more structure will be needed.
Population level interventions (public education campaign)	Acute/sub-acute LBP	?	0	+	+	In Victoria, a state-wide campaign to educate the population and encourage early RTW after onset of LBP was associated with subsequent reduction in claims for LBP and reduced medical costs as well as attitude changes among the community and GPs, compared to NSW where attitudes did not change. Buchbinder et al. (2001). This was not a RCT and was aimed at acute/sub-acute LBP, but the results may be relevant to preventing disability from chronic pain.

APPENDIX 2: COST EFFECTIVENESS OF SELECTED INTERVENTIONS FOR CHRONIC PAIN

Year of study	Intervention	Results (currency/QALY where available)	Author(s)
Multidisciplinary Treatment*			
2007	Cost effectiveness of physiotherapist-led “patient active” treatments for chronic low back pain (eg simple exercises without special equipment and education) vs. usual outpatient physiotherapy	Cost-saving	Critchley et al, 2007
2006	Cost effectiveness of comprehensive pain programs vs. conventional medical treatment for chronic nonmalignant pain	Cost-saving	Gatchel & Okifuji, 2006
2006	Cost-utility of interdisciplinary chronic spinal pain treatment vs. traditional medications and procedures alone – retrospective case study in the USA	Cost-saving US\$57,627/QALY to \$75,885/QALY	Hatten et al, 2006
2002	Comprehensive pain rehabilitation programs (PRPs) (eg multidisciplinary pain treatment) vs. other treatments for chronic pain (eg spinal cord stimulation alone) – literature review	Cost-saving	Gatchel and Okifuji (2006)
2002	Cost effectiveness of a light multidisciplinary treatment program vs. an extensive multidisciplinary program for patients with chronic low back pain (including outcomes in terms of returning to work after pain) – randomised control trial in Norway	Cost-saving for men only	Haldorsen et al, 2002
Selected Pharmacological Interventions			
2007	Effectiveness of nonnarcotic protocol for the treatment of acute exacerbations of chronic nonmalignant pain vs. narcotic interventions – prospective observational study in the USA	Cost-saving, in terms of hospital utilisation	Svenson & Meyer, 2007
2007	Cost effectiveness of a vaccine to prevent pain-causing herpes zoster (“shingles”) vs. alternative therapy (eg antiviral drugs) in older adults	Dominated for most age groups	Rothberg et al, 2007
2006	Economic evaluation of oral treatments for neuropathic pain (comparison of amitriptyline, carbamazepine, gabapentin, and tramadol)	Amitriptyline and carbamazepine are more cost effective than tramadol and gabapentin	Cepeda & Farrar, 2006
2006	Cost effectiveness of various triptans for acute migraine therapy (comparison of almotriptan, eletriptan, naratriptan, rizatriptan, sumatriptan, and zolmitriptan)	Almotriptan 12.5 mg and rizatriptan 10 mg (Maxalt) most cost effective	Kelman et al, 2006

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Year of study	Intervention	Results (currency/QALY where available)	Author(s)
Surgical Interventions			
2007	Cost effectiveness and cost-utility of treating failed back surgery syndrome using spinal cord stimulation (SCS) versus reoperation – RCT in the USA	Cost-saving	North et al, 2007
2006	Cost effectiveness of spinal cord stimulation (SCS) in complex regional pain syndrome (CRPS) and refractory neuropathic back and leg pain/failed back surgery syndrome (FBSS) vs. alternative therapy (eg physical therapy alone) – RCT and meta-analysis	Cost-saving in the long-run	Taylor, 2006
2006	Cost effectiveness of spinal cord stimulation (SCS) in the management of patients with complex regional pain syndrome (CRPS) vs. physical therapy alone – RCT in the UK	Cost-saving (US\$23,480/QALY)	Taylor et al, 2006
2004	Cost-benefit analysis of neurostimulation of the spinal cord and peripheral nerves for chronic pain	Cost-saving in the long-run	Mekhail et al, 2004
2004	Cost effectiveness of initial lumbar fusion vs. nonsurgical treatment for chronic low back pain - randomised, controlled trial from the Swedish Lumbar Spine Study Group	Cost-saving	Fritzell et al, 2004
2004	Cost effectiveness of spinal cord stimulation in the treatment of pain vs. other therapy (eg physical therapy alone) – literature review	Cost-saving in the long-run	Taylor et al, 2004
2002	Cost effectiveness of spinal cord stimulation (SCS), compared with best medical treatment/conventional pain therapy – group of patients with failed back syndrome in Canada	Cost-saving in the long-run despite high initial cost of implantable devices.	Kumar et al, 2002
Other Interventions			
2005	Combined manipulative treatment, stabilising exercises, and physician consultation compared with physician consultation alone for chronic low back pain – RCT in Finland	Dominated	Niemisto et al, 2005
2005	Cost effectiveness of chiropractic vs. primary medical care for acute and chronic low back pain (LBP)	Cost-saving in the short term for chronic LBP	Haas et al, 2005

* Note that some studies involved one discipline supported by another (eg. Critchley et al, 2007), while others involved a team approach. Common across studies was training patients in pain self-management strategies.

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