The economic cost of arthritis in New Zealand in 2010

13 April 2010

Report by Access Economics Pty Limited for:
Arthritis New Zealand

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List of acronyms

AF	attributable fraction
AIHW	Australian Institute of Health and Welfare
bn	billion
COX-2	Cyclo-oxygenase-2
DALY	disability adjusted life year
DHBs	district health boards
GDP	gross domestic product
GP	general practitioner/practice
HRC	Health Research Council (of New Zealand)
ICD-10	International Classification of Disease Tenth Revision
m	million
MOH	Ministry of Health
MRI	magnetic resonance imaging
NSAIDs	non-steroidal anti-inflammatory drugs
NZ	New Zealand
NZHIS	New Zealand Health Information Service
NZHS	New Zealand Health Survey
OA	osteoarthritis
OECD	Organization for Economic Cooperation and Development
OR	odds ratio
PPP	purchasing power parity
QALY	quality adjusted life year
RA	rheumatoid arthritis
RNZCGPRU	Royal New Zealand College of General Practitioners Research Unit
SLE	systemic lupus erythematosus
SNZ	Statistics New Zealand
TNF	tumour necrosis factor
VLY	value of a life year
VSL	value of a statistical life
YLD	years of healthy life lost due to disability
YLL	years of life lost due to premature mortality

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Access Economics was commissioned by Arthritis New Zealand in late 2009 to update our 2005 report '*The Economic Cost of Arthritis in New Zealand*' (Access Economics, 2005a) to estimate prevalence and costs of arthritis in New Zealand 2010. Using the 2005 report as the baseline, this updated report utilises:

- new population data from Statistics New Zealand (SNZ), and new prevalence data on arthritis from the 2006-07 New Zealand Health Survey (NZHS);
- updated health system costs with the latest hospital data from the New Zealand Health Information Service (NZHIS) and updated other health cost elements including the cost of new pharmaceuticals, notably the introduction of biological medications since 2005 (not included in the 2005 report);
- re-estimation of all the indirect costs, remodelled for 2010 based on wage and price inflation and other cost indices;
- remodelled burden of disease (using the new prevalence estimates) and a revised Value of a Statistical Life Year (VSLY) for NZ in light of the new literature on this topic in recent years.

Unlike the previous report, this one does not provide different scenarios for obesity. All monetary figures quoted are in New Zealand dollars unless noted otherwise.

Executive Summary

In 2010, over 530,000 New Zealanders aged 15 or over are living with at least one type of arthritis. This equates to 15.2% of the total population aged 15 or over, or nearly 1 in 6 people.

- Over half are female (57.8%) and over half (54%) are of working age (15-64 years).
- 9.4% of people with arthritis are of Māori descent, much lower than their population share (15.2%), largely because of the younger Māori age distribution.
  - In younger age groups, arthritis is more common in Māori people; in older age groups prevalence rates are similar due to the influence of osteoarthritis.
- Prevalence is expected to grow to over 650,000 people by 2020 (16.9% of the population aged 15 or over), largely due to demographic ageing.

The total financial costs of arthritis in New Zealand in 2010 are estimated to be $3.2 billion or 1.7% of GDP. Financial costs comprise health sector costs and indirect costs.

- In addition, the burden of disease – the years of healthy life lost because of arthritis – is estimated as 21,491 Disability Adjusted Life Years (DALYs) in 2010.
  - Converting this to financial terms using the value of a statistical life year of $177,683 for New Zealand in 2010, equates to **some $3.8billion in suffering and premature death** for those with arthritis this year.

Health sector costs of arthritis are estimated to be $695m in 2010, 22% of total financial costs.

- **Hospital costs** represent around one third of health sector costs ($237m).
  - Public inpatient costs are 42% of hospital costs ($99.9m), and are dominated by osteoarthritic knee and hip surgeries.
  - Private inpatient costs are estimated as $82.4m (35% of hospital costs) while outpatient services are estimated as $55.0m (23%).
- **Pathology and imaging** together are estimated to be 12% of health sector costs ($63.7m), quite a high share compared with other countries.
- Out of hospital **specialist services** (mainly for rheumatologists and orthopaedic surgeons) are also relatively high at $30.9m (4.4% of health sector costs).
- In contrast, **general practice (GP) and pharmaceutical health sector cost shares** are relatively low – 3% ($22.8m) and 6% ($41.8m) respectively.
- **Allied health and aged care** are each around 12% of health sector costs ($81m and $87m respectively).
- **Research** is estimated as 2% of health sector costs ($12.4m).
- The remaining health costs comprise capital expenditures, expenditure on community health, public health programmes, health administration and health aids and appliances, which together are estimated as $97.3m (14% of health sector costs) in 2010 for arthritis.

The indirect costs of arthritis ($2.50bn) outweigh health costs around 3.6 to 1.

- People with arthritis are **5% less likely to be employed** than those without arthritis, based on New Zealand Health Survey data.
  - Over 25,000 New Zealanders will not work in 2010 due to arthritis, costing around $1.48 billion in lost productivity in 2010.
  - In addition, temporary absences from work due to arthritis also impose costs of some $25m in 2005.
  - **Together lost production is the largest cost of arthritis, representing nearly half (47%) of the total financial costs in 2010**.
- **Informal care** is the second largest cost at 23% of total financial costs ($752m), measured on a conservative opportunity cost basis.
  - The replacement value of this informal care is very large at $5.0bn, for activities of daily living only (excluding assistance with household tasks).
  - Formal sector community care for people with arthritis costs $55m per annum.
- **Aids, modifications and travel** for people with arthritis are estimated to cost $66m in 2010 (2% of total financial costs).
- **Deadweight costs** arising due to the distortionary and administrative impacts of raising additional taxation and making additional welfare payments are estimated as $130m per annum (4%).

Arthritis is a highly prevalent and costly disease, necessarily a national health priority area due to the extent of its prevalence and socioeconomic impacts. Cost-effective interventions can include those targeted at reducing obesity, continued investment in research and development to delay the onset of osteoarthritis, and self-management education. Such options offer potential for substantial reductions in the future projected costs of the disease, and pathways to enhanced wellbeing for New Zealanders in the future.

Access Economics
April 2010

1 Prevalence

The best method of measuring community prevalence is through **well-designed clinical studies of populations, preferably longitudinal and prospective**. However, there do not appear to be such studies in relation to arthritis in New Zealand**.** This is recommended; as such studies are very useful to inform policy makers in relation to risk factors, impacts and the cost-effectiveness of interventions and preventive activities.

In the absence of detailed New Zealand epidemiological studies, the best estimate of community arthritis prevalence obtainable is from **well-designed self-report surveys**, as these tend to capture some undiagnosed arthritis as well as almost all diagnosed arthritis. Self-reported data have occasionally been criticised due to the allegation that people:

- do not have sufficient information to know whether or not they have a particular condition (differential self-diagnosis);
- may have recall problems; or
- may be 'led' in the survey or due to other incentives to misrepresent or misclassify their condition.

While this may be true in some instances, in general anonymous non-coercive self-reported data for current long term conditions that are not mental illnesses have tended to support prevalence estimates based on clinical studies, with no significant bias towards under or over-reporting (e.g. Benitez-Silva et al, 2000). Moreover, more recent survey verification techniques are utilised (such as cross-checks with other household members or aged care facility staff, detailed questioning regarding the condition etc) in order to minimise any such potential bias.

The Ministry of Health (MOH) New Zealand Health Survey (NZHS) provides such data. The most recent NZHS was conducted between October 2006 and November 2007 and had over 12,000 adults and nearly 5,000 children aged from birth to 14 years, including Mäori, Pacific peoples and Asian people. Appendix A contains prevalence rates by age, gender and ethnicity for arthritic conditions, as reported in the 2006-07 NZHS. Detailed splits by age and ethnicity were calculated base on Access Economics (2006).

Appendix B provides the Survey questions from the NZHS on arthritis. A key point to note in relation to the questions is that prevalence is based on a 'Yes' answer to the question (Q1.28) 'Have you ever been told by a doctor you have arthritis?' so the estimate is of diagnosed arthritis. The follow-up question differentiates type of arthritis (that affects the person the most) – rheumatoid, osteoarthritis, other known type (specified) and 'don't know'. The questions thus under-report different types of arthritis – since if a person has two kinds, only one is reported. Also, because some people do not know the type they have, rheumatoid, osteoarthritis and 'other' will sum to less than the 'total'. This is the reverse of the Australian National Health Survey, where significant comorbidity of different types of arthritis means that the sum of the components is greater than the total.

1.1 Prevalence rates

Prevalence rates of various arthritic and related conditions, from various sources across the New Zealand population as a whole, are summarised in Table 1.1. As would be expected, self-reported prevalence from the 2003 NZHS is considerably higher than surveys of prevalence within the primary care system for the same year, such as Taylor et al (2004)[1]. Such surveys only identify those people with arthritis who also seek medical attention for their condition within a certain period, and the methods typically search on keywords that may omit certain types of arthritis. However, results from the NZHS are very similar to Access Economics' estimates of prevalence in Australia, based on the Australian Bureau of Statistics' (2002) *National Health Survey*.

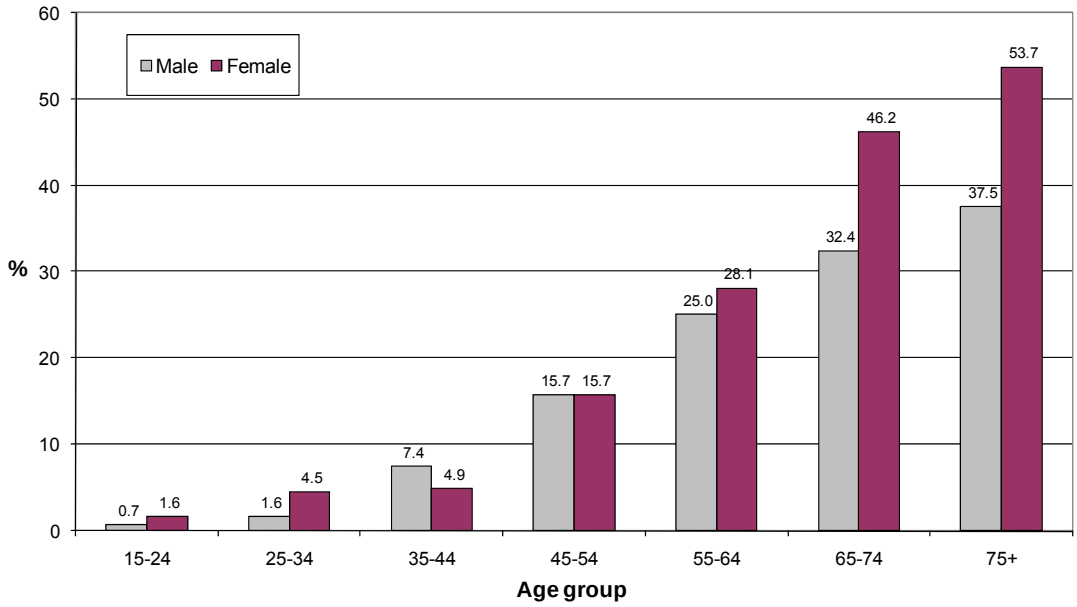
Table 1.1: Arthritis prevalence rates – meta analysis

	NZHS	Taylor et al (2004)	Colmar Brunton	Access Economics
Type of study	NZ community based	NZ primary care based	NZ community based	Australia community based
Data reference year	2003	2003	2003	2005
Osteoarthritis	7.7%	1.44%	na	7.8%
Rheumatoid arthritis	3.2%	0.79%	na	2.5%
All forms of arthritis	15.7%	3.75%	na	16.7%
All forms of musculoskeletal disorder	32.7%	20.4%	24.6%	32.8%

Age-specific prevalence rates for both men and women derived from the 2006-07 NZHS are shown in Figure 1.1. The graph shows that the age-gender distribution of self-reported prevalence rates in New Zealand is broadly similar to those reported in other community-based surveys (Access Economics, 2005; Access Economics, 2007). Arthritis is more prevalent in older age groups, and is generally more prevalent in women than men.

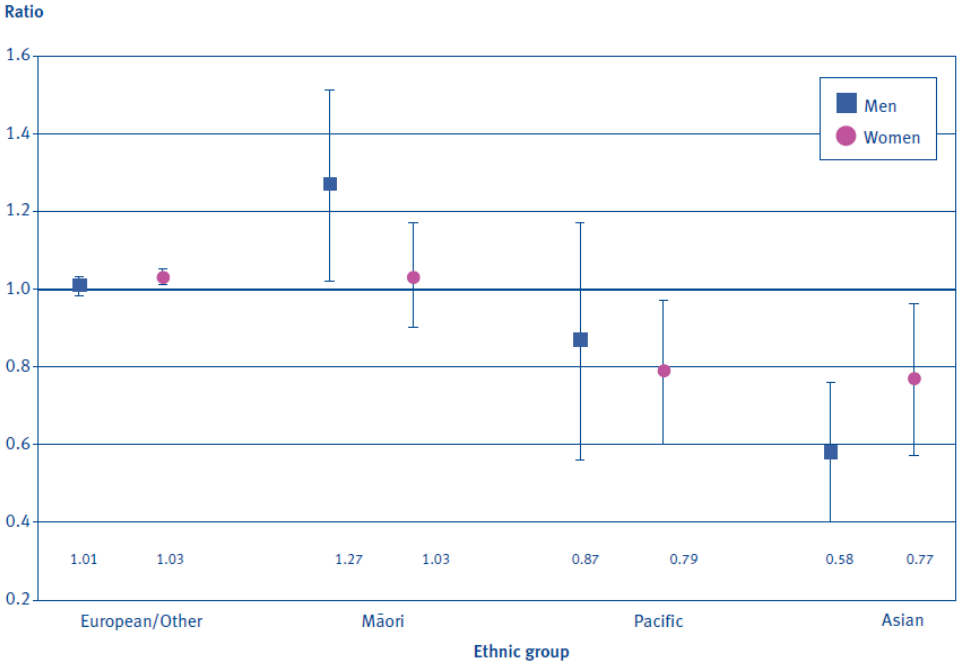
[1] Taylor et al (2004) estimated the burden of rheumatic (musculoskeletal) disorders in the New Zealand population by calculating GP consultation rates—as well as the influence of age, gender, ethnicity, and small-area deprivation on these consultation rates. Cases were identified from the Royal New Zealand College of General Practitioners database using search-strings of typical words used in consultation notes (for each of 10 rheumatic disorders). Rates were calculated from a denominator of the number of people attending at least once over a 12-month period to any of 22 contributing GPs. The independent effect of age, sex, ethnicity, and small-area deprivation was modelled using multiple logistic regression. Of 29,152 people attending their GP, 20.4% consulted with a rheumatic disorder. Older people, males, people who lived in more deprived areas, and Europeans were more likely to consult with a rheumatic disorder. With all rheumatic disorders, age was a significant influence upon consultation—especially osteoarthritis, gout, osteoporosis, and joint surgery. Mäori were more likely than Europeans to consult with gout, but they were slightly less likely to consult with back pain or regional pain disorders. Small-area deprivation had small influences upon people consulting with gout, regional pain, and back pain. Taylor et al (2004) noted that rheumatic (musculoskeletal) disorders form a significant part of the workload of GPs and this is significantly influenced by local demographic factors. Most of these conditions seen by GPs are non-inflammatory and non-surgical. Taylor et al (2004) concluded, as we do, that if a community-needs approach were taken, it is likely that the workload and associated costs estimated would be even greater.

Figure 1.1: Age-specific prevalence rates, arthritis, New Zealand, 2006-07



As shown in Figure 1.2, there were statistically significant age-standardised differences between ethnic groups shown in the 2006-07 NZHS. Māori men had an increased prevalence of arthritis, after adjusting for age, compared to men overall. Pacific women and Asian men and women had a significantly lower prevalence of arthritis than overall. European/other women had a slightly higher prevalence of arthritis, mostly due to an increased prevalence of osteoarthritis (Ministry of Health, 2008).

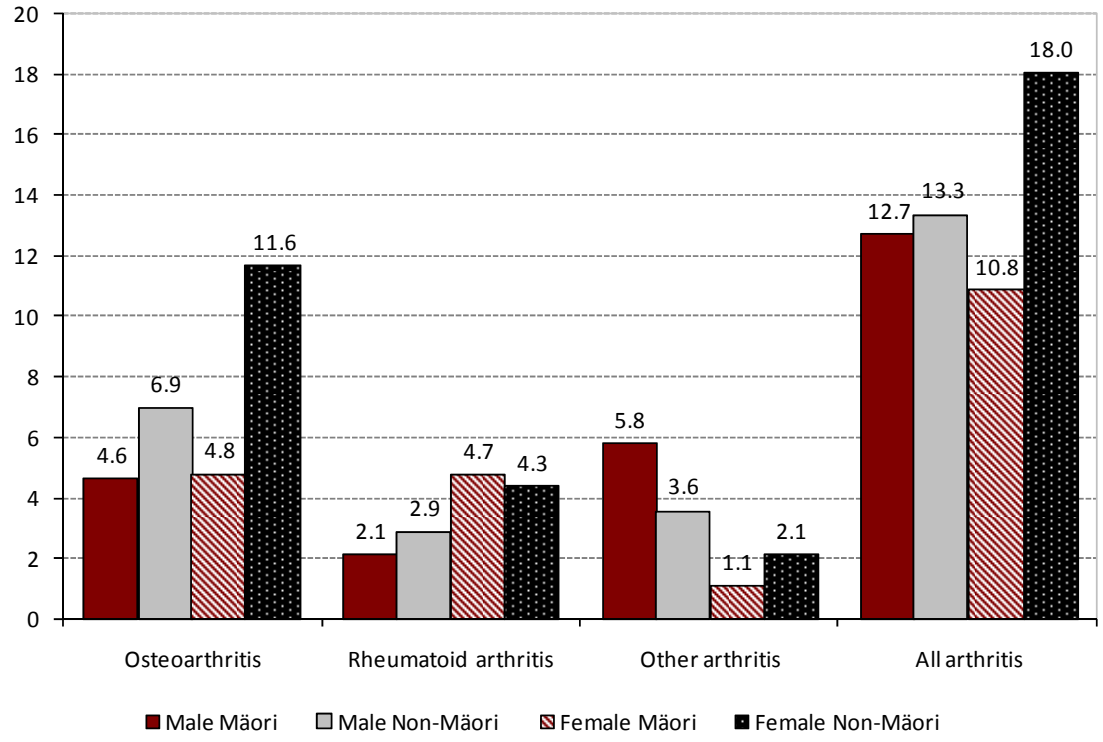
Figure 1.2: Arthritis in adults, by ethnic group & gender (age-standardised rate ratio)



Source: Ministry of Health (2008:165).

Raw prevalence rates for osteoarthritis (i.e. across all age groups) are lower in Māori than non-Māori men and women, which drives the same result for all arthritis (Figure 1.3) – this is due to the younger age distribution of Māori people. Rates for rheumatoid arthritis are broadly similar by gender across ethnic groups, while 'other' arthritis is higher in Māori men but lower in Māori women relative to non-Māori people. This may be due in part to gout, where known risk factors are ethnicity (Māori[2] or Pacific Islander[3]) and male gender (Smelser, 2002, cited in Duthie et al, 2004).

Figure 1.3: Raw prevalence rates (%) by type of arthritis, New Zealand 2010

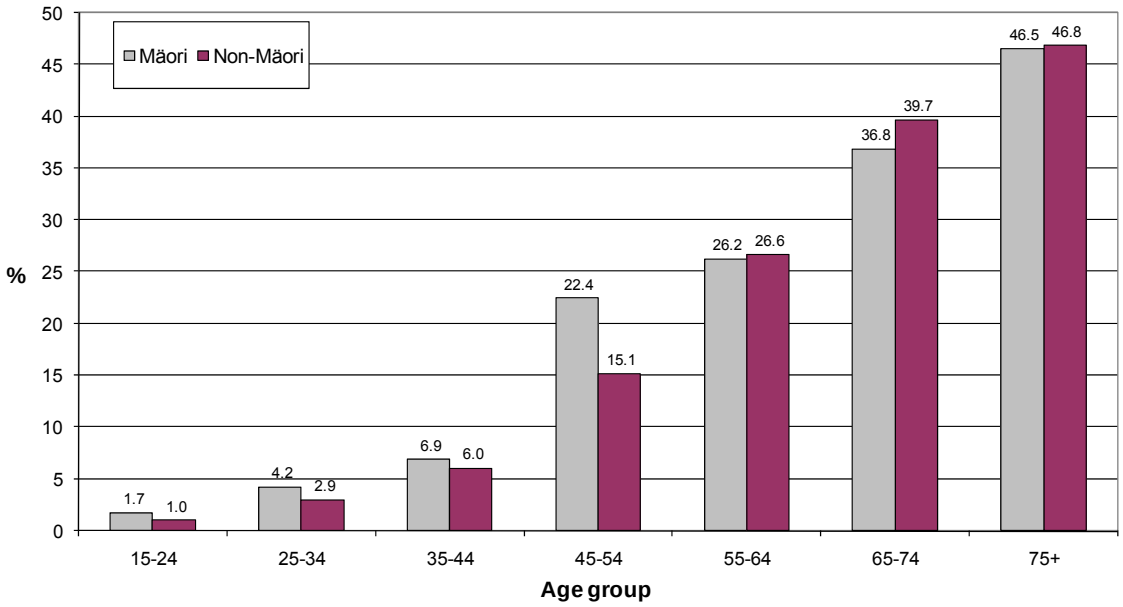


The age distribution of arthritis in the Māori population is quite different from that of the total population (see Figure 1.4). In the older age groups, arthritis prevalence rates in Māori people are similar, due to the influence of osteoarthritis, while in the younger age groups, prevalence rates in Māori people are higher, due to the influence of other types of arthritis such as gout, as noted above, where being Māori increases risk.

[2] Partly due to genetic variations affecting elimination of uric acid contributing to gout (Gibson et al, 1984; Klemp et al, 1997) .

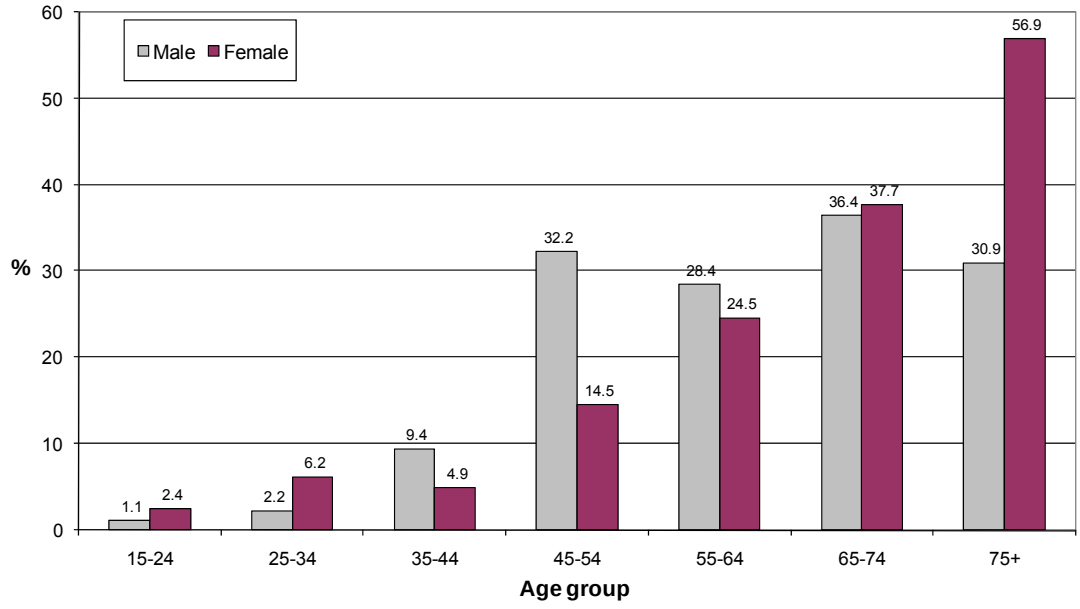
[3] The Pacific Island population is a sizeable group in New Zealand with relatively high prevalence of gout and obesity, which is a risk factor for osteoarthritis. Separate consideration of the Pacific Islander population was, however, beyond the scope of this report.

Figure 1.4: Age-specific prevalence rates, all arthritis, by ethnicity, New Zealand, 2010



Arthritis is more common in middle aged Māori men (35 to 64 years) than Māori women of the same age or relative to the general population of the same age. These data should be interpreted with care, however, due to the smaller number of observations.

Figure 1.5: Age-specific prevalence rates, Māori, by gender, New Zealand, 2010



1.2 Baseline prevalence 2010 to 2020

Prevalence rates from the 2006-07 NZHS were combined with demographic projections of New Zealand's population by age, gender and ethnicity from 2010 to 2020 (Statistics New Zealand website) to estimate the likely prevalence of arthritis in New Zealand in 2010 and 2020. These

estimates account for the ageing of the New Zealand population over the next ten years, but do not include any interventions that may delay or reduce the onset of arthritis (e.g. research breakthroughs, improvement in risk factors) nor any other factors that may increase the prevalence rates of arthritis (e.g. worsening of risk factors). Obesity is an important risk factor for arthritis, and the potential impact on these baseline projections of possible changes in obesity rates was considered in Access Economics (2005a).

Baseline projections are summarised in Table 1.2 below. More detailed prevalence projections are contained in Table 1.4 (2010) and Table 1.5 (2020).

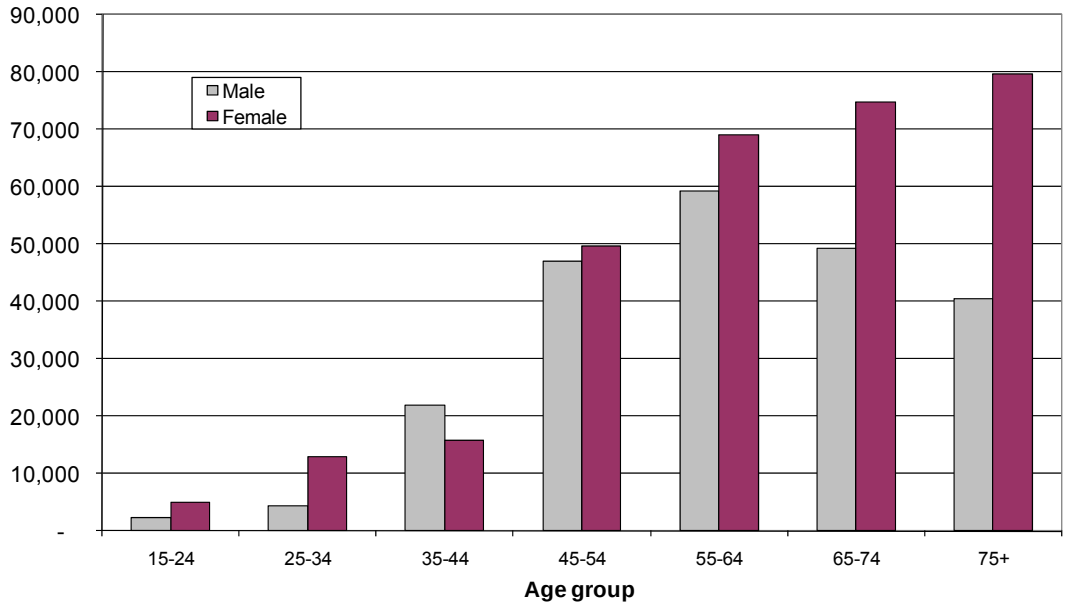
Table 1.2: Baseline prevalence projections 2010 and 2020

	2010	2020
Total males	223,956	272,137
Total females	306,411	378,196
Total Mäori	49,973	64,378
Total non-Mäori	480,396	585,955
Total no. of persons	530,369	650,333
% of 15+ population	**15.2%**	**16.9%**

Source: Access Economics. Note: Totals may not sum due to rounding.

In 2010, some 530,369 New Zealanders (15.2%) over the age of 15 are living with at least one type of arthritis. Of these people, an estimated 306,411 (57.8%) are female and 223,956 (42.2%) are male. While arthritis is commonly thought of as an older person's disease, 54.0% (286,645) of New Zealanders with arthritis in 2010 are of working age (15 to 64), as shown in Figure 1.6.

Figure 1.6: Prevalence (no. of people) by age & gender, New Zealand, 2010



An estimated 9.4% of people with arthritis are of Mäori descent although Mäori people currently form 15.2% of New Zealand's population. This anomaly is largely explained by the

relatively high proportion of younger Mäori people. In fact 35% of Mäori people are aged 0-14 years, compared to 18% of non-Mäoris. When the people under 15 are excluded, the differential is much smaller – Mäori people make up 12.5% of the population aged 15 and over. The higher prevalence of arthritis in middle-aged Mäori males means the difference between share of population and share of arthritis cases is a lot smaller in Mäori males (1.1 percentage point) than total male population (5.2 percentage points).

Table 1.3: Population and arthritis shares, Mäori and non-Mäori

	% Population 15+	% Arthritis 15+	Difference
Male Mäori	6.0%	4.9%	-1.1 percentage point
Male other	42.5%	37.3%	-5.2 percentage points
Female Mäori	6.5%	4.5%	-2.0 percentage points
Female other	44.9%	53.2%	8.3 percentage points
Total	**100%**	**100%**	
All males	48.5%	42.2%	-6.3 percentage points
All females	51.5%	57.8%	6.3 percentage points
Mäori	12.5%	9.4%	-3.1 percentage points
Other	87.5%	90.6%	3.1 percentage points

Source: Access Economics

Due to the expected demographic ageing of the New Zealand population over the next ten years, the number of people with arthritis will increase further, as more people move into the older age cohorts where arthritis is more prevalent. By 2020 around 650,333 New Zealanders will have arthritis. This is equivalent to 16.9% of the population - an increase of around 1.6 percentage points from the 15.2% in 2010. By 2050, the number of New Zealanders with arthritis will rise to around 780,000 (Figure 1.7).

Figure 1.7: Projected prevalence 2010 to 2050

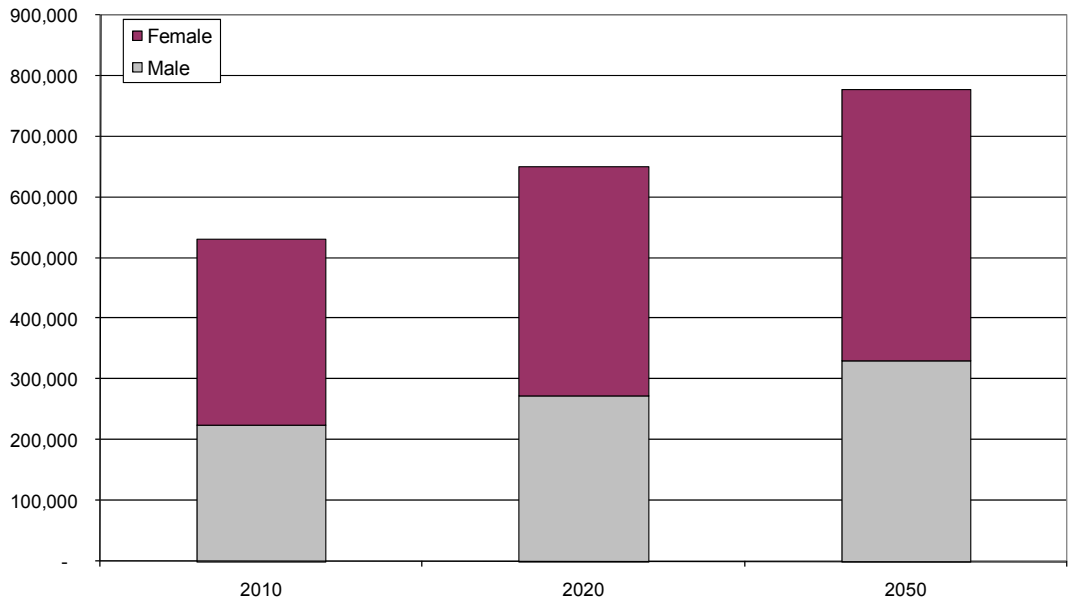


Table 1.4: Prevalence by age, gender, ethnicity and type of arthritis, 2010

Age	All ethnicities			Māori			Non-Māori		
	All	Female	Male	All	Female	Male	All	Female	Male
Osteoarthritis									
15-24	-	-	-	-	-	-	-	-	-
25-34	5.7	4.3	1.4	1.4	1.2	0.2	4.3	3.1	1.2
35-44	11.0	5.1	5.9	1.1	1.1	-	9.9	4.0	5.9
45-54	50.4	26.5	23.9	7.7	2.6	5.1	42.7	23.9	18.8
55-64	73.3	46.4	27.0	5.4	2.8	2.6	67.9	43.6	24.3
65-74	80.9	50.3	30.6	3.5	1.9	1.7	77.4	48.5	28.9
75+	83.7	60.0	23.7	1.2	1.2	-	82.4	58.8	23.7
Total	**305.1**	**192.6**	**112.4**	**20.4**	**10.8**	**9.6**	**284.7**	**181.8**	**102.8**
Prevalence 15+ (%)	**8.8**	**10.8**	**6.7**	**4.7**	**4.8**	**4.6**	**9.4**	**11.6**	**6.9**
Rheumatoid arthritis									
15-24	5.3	4.0	1.3	1.1	0.8	0.3	4.3	3.2	1.1
25-34	7.7	6.3	1.4	1.5	1.5	-	6.2	4.9	1.4
35-44	12.1	7.1	5.0	1.8	0.9	0.9	10.2	6.2	4.1
45-54	22.7	16.1	6.6	4.2	2.9	1.4	18.4	13.2	5.2
55-64	28.7	16.7	12.1	4.1	3.0	1.1	24.6	13.7	10.9
65-74	25.4	15.2	10.2	1.7	1.3	0.4	23.7	13.9	9.8
75+	23.6	13.3	10.2	0.7	0.4	0.4	22.8	13.0	9.9
Total	**125.4**	**78.7**	**46.7**	**15.1**	**10.8**	**4.4**	**110.3**	**68.0**	**42.3**
Prevalence 15+ (%)	**3.6**	**4.4**	**2.8**	**3.5**	**4.7**	**2.1**	**3.6**	**4.3**	**2.9**
Other arthritis*									
15-24	1.9	0.9	1.0	0.4	0.2	0.2	1.5	0.7	0.8
25-34	3.9	2.3	1.6	0.6	0.4	0.2	3.3	1.9	1.4
35-44	14.4	3.5	10.9	2.6	0.5	2.1	11.9	3.1	8.8
45-54	23.4	6.9	16.5	6.0	-	6.0	17.4	6.9	10.5
55-64	26.0	5.9	20.1	2.2	-	2.2	23.8	5.9	17.9
65-74	17.6	9.2	8.3	1.8	0.7	1.1	15.8	8.5	7.3
75+	12.7	6.2	6.5	0.9	0.7	0.2	11.7	5.5	6.2
Total	**99.9**	**35.0**	**64.8**	**14.4**	**2.4**	**12.0**	**85.4**	**32.6**	**52.8**
Prevalence 15+ (%)	**2.9**	**2.0**	**3.8**	**3.3**	**1.1**	**5.8**	**2.8**	**2.1**	**3.6**
Arthritis - all forms									
15-24	7.3	5.0	2.3	1.4	1.0	0.4	5.8	4.0	1.8
25-34	17.3	12.9	4.4	3.4	3.0	0.4	13.9	9.9	3.9
35-44	37.5	15.8	21.7	5.5	2.5	3.0	32.0	13.2	18.8
45-54	96.5	49.5	47.0	17.9	5.5	12.4	78.6	44.0	34.6
55-64	128.1	68.9	59.1	11.8	5.8	6.0	116.3	63.1	53.1
65-74	123.8	74.8	49.1	7.0	3.9	3.1	116.9	70.9	46.0
75+	119.9	79.5	40.4	2.9	2.3	0.6	117.0	77.2	39.8
Total	**530.4**	**306.4**	**224.0**	**50.0**	**24.0**	**26.0**	**480.4**	**282.4**	**198.0**
Prevalence 15+ (%)	**15.2**	**17.1**	**13.3**	**11.7**	**10.8**	**12.7**	**15.8**	**18.0**	**13.3**

* 'Other arthritis' is derived as a residual. Components may not sum exactly to totals due to rounding.

Table 1.5: Prevalence by age, gender, ethnicity and type of arthritis, 2020

Age	All ethnicities			Māori			Non-Māori		
	All	Female	Male	All	Female	Male	All	Female	Male
Osteoarthritis									
15-24	-	-	-	-	-	-	-	-	-
25-34	6.6	4.9	1.7	1.7	1.4	0.3	4.9	3.5	1.4
35-44	10.6	4.9	5.7	1.1	1.1	-	9.5	3.8	5.7
45-54	50.0	26.8	23.2	8.2	2.9	5.4	41.7	23.9	17.8
55-64	90.0	57.6	32.5	8.2	4.4	3.9	81.8	53.2	28.6
65-74	115.3	71.8	43.5	5.6	3.0	2.6	109.6	68.7	40.9
75+	110.1	76.7	33.4	2.3	2.3	-	107.7	74.4	33.4
Total	**382.5**	**242.5**	**139.9**	**27.1**	**15.0**	**12.1**	**355.3**	**227.5**	**127.8**
Prevalence 15+ (%)	**9.9**	**12.3**	**7.5**	**5.4**	**5.8**	**5.0**	**10.6**	**13.3**	**7.8**
Rheumatoid arthritis									
15-24	5.1	3.9	1.2	1.0	0.8	0.3	4.1	3.1	1.0
25-34	8.8	7.2	1.7	1.8	1.8	-	7.1	5.4	1.7
35-44	11.6	6.7	4.9	1.7	0.9	0.9	9.8	5.8	4.0
45-54	22.6	16.2	6.4	4.6	3.2	1.4	18.0	13.1	5.0
55-64	35.2	20.7	14.5	6.3	4.7	1.6	28.9	16.0	12.9
65-74	36.1	21.7	14.4	2.7	2.1	0.6	33.4	19.6	13.8
75+	31.4	17.0	14.4	1.4	0.7	0.7	30.1	16.4	13.7
Total	**150.9**	**93.4**	**57.5**	**19.5**	**14.1**	**5.5**	**131.4**	**79.4**	**52.1**
Prevalence 15+ (%)	**3.9**	**4.7**	**3.1**	**3.9**	**5.4**	**2.3**	**3.9**	**4.6**	**3.2**
Other arthritis*									
15-24	1.8	0.9	0.9	0.4	0.2	0.2	1.5	0.7	0.7
25-34	4.6	2.6	2.0	0.7	0.4	0.3	3.9	2.2	1.7
35-44	14.0	3.3	10.6	2.4	0.5	2.0	11.5	2.9	8.7
45-54	23.0	7.0	15.9	6.3	-	6.3	16.7	7.0	9.7
55-64	31.5	7.3	24.2	3.3	-	3.3	28.2	7.3	20.9
65-74	25.0	13.2	11.8	2.8	1.1	1.7	22.2	12.0	10.2
75+	17.1	8.0	9.1	1.8	1.3	0.4	15.3	6.6	8.7
Total	**116.9**	**42.3**	**74.7**	**17.7**	**3.5**	**14.2**	**99.2**	**38.7**	**60.5**
Prevalence 15+ (%)	**3.0**	**2.1**	**4.0**	**3.5**	**1.4**	**5.9**	**3.0**	**2.3**	**3.7**
Arthritis - all forms									
15-24	7.0	4.8	2.2	1.4	1.0	0.4	5.6	3.8	1.7
25-34	20.0	14.6	5.4	4.2	3.6	0.6	15.8	11.1	4.8
35-44	36.1	14.9	21.3	5.2	2.4	2.8	30.9	12.5	18.4
45-54	95.6	50.0	45.5	19.1	6.0	13.0	76.5	44.0	32.5
55-64	156.8	85.6	71.2	17.9	9.1	8.8	138.9	76.5	62.4
65-74	176.4	106.6	69.8	11.2	6.2	4.9	165.2	100.3	64.9
75+	158.6	101.7	56.8	5.4	4.3	1.1	153.1	97.4	55.7
Total	**650.3**	**378.2**	**272.1**	**64.4**	**32.6**	**31.8**	**586.0**	**345.69**	**240.4**
Prevalence 15+ (%)	**16.9**	**19.2**	**14.5**	**12.9**	**12.6**	**13.2**	**17.5**	**20.2**	**14.7**

* 'Other arthritis' is derived as a residual. Components may not sum exactly to totals due to rounding.

1.3 Risk factors for arthritis

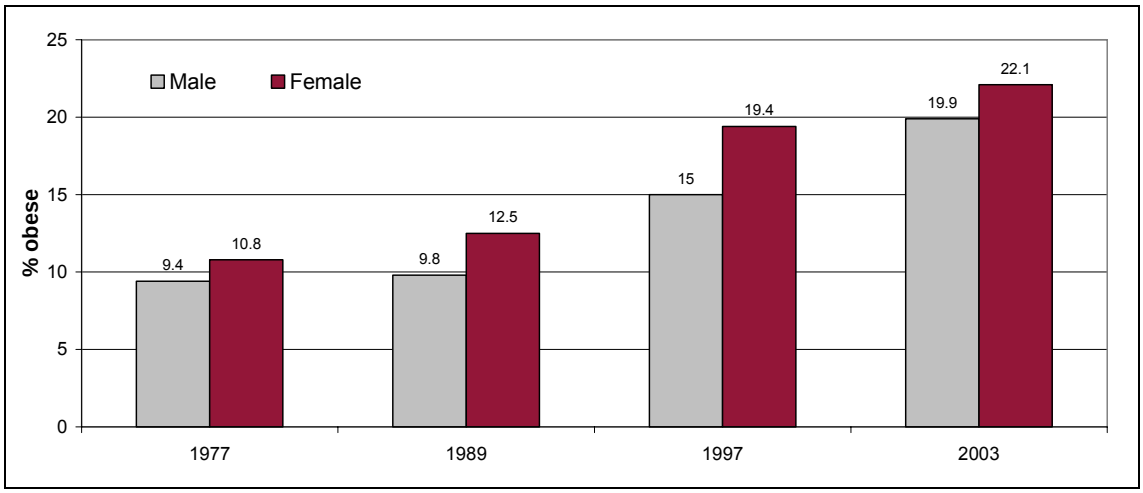
1.3.1 Obesity

The prevalence projections estimate the number of New Zealanders with arthritis in the future, assuming that prevalence rates remain constant for each age-gender cohort. While these projections account for expected demographic ageing of the New Zealand population, they do not take into account the effect of any intervention that may delay or reduce the incidence of arthritis. Possible increases in future prevalence rates due to an increased presence of known risk factors are also not taken into account. One known risk factor is obesity.

Like many developed countries, the average body mass index (BMI) of the New Zealand population has grown in recent decades, together with the proportion of the population classified as overweight or obese. The Ministry of Health (2004b) provides an analysis of obesity trends in New Zealand from 1977 to 2003, based on results from four nationally representative health or nutrition surveys undertaken in 1977, 1989, 1997 and 2003.

Figure 1.8 shows that the percentage of the population classified as obese has risen from each survey to the next. In 1977 around 9.4% of men and 10.8% of women were obese, but this doubled to 19.9% of men and 22.1% of women in 2003.

Figure 1.8: Obesity prevalence by gender, 1977 to 2003



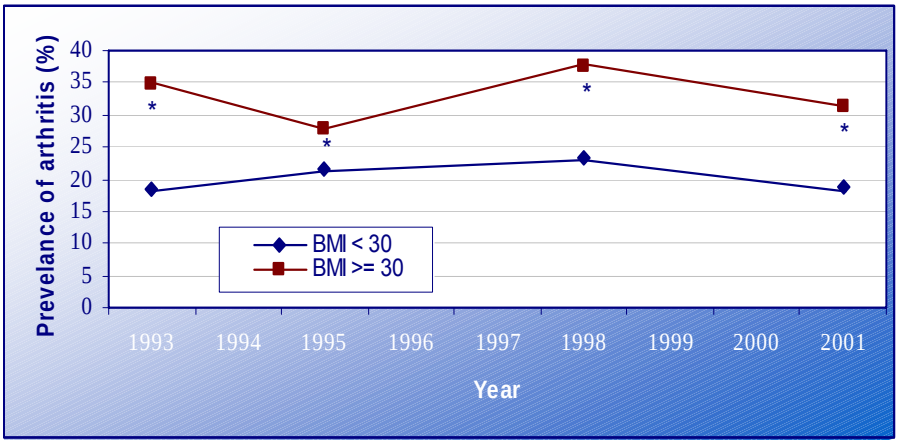
Source: Ministry of Health (2004b)

The literature shows a quantitative link between obesity and arthritis.

- The odds ratio of osteoarthritis associated with obesity is in the range of 2 to 4 depending on the site of arthritis. The population-attributable risk suggests that up to 24% of knee arthritis could be attributed to obesity (Vermont Department of Health, 1999), for example.
- An Oregon study found that 27% of adults with arthritis are obese whereas among adults without arthritis, only 18% are obese (Oregon Department of Human Services, 2004).

- A South Australian study (Gill et al, 2003) also found significant differences between arthritis prevalence in obese and non-obese populations, utilising annual data from the Health Omnibus Study, 1991-1998, 2001. The results are shown in Figure 1.9 below; in 2001 the difference was around 12 percentage points.

Figure 1.9: Obesity and arthritis prevalence, South Australia



Source: Gill et al (2003).

Access Economics (2005b) estimated that 18.1% of arthritis in males and 17.8% of arthritis in females is attributable to obesity. These percentages are known as the 'attributable fraction' for males and females – i.e. the proportion of arthritis due to obesity.

1.3.2 Other risk factors

Other known risk factors for arthritis include age, female gender, lower education and income, physical inactivity, overweight and obesity; other possible risk factors, such as smoking and being divorced, are less well established (Fontaine, 2002). There are also other and sometimes contradictory risk factors for different types of arthritis – for example, rheumatoid arthritis may be associated with being underweight, rather than overweight (Access Economics, 2001). Possibly related is the reduction in overall prevalence of RA reported in Duthie et al (2004) citing Silman (2002), Doran et al (2002) and Collings and Highton (2002). The decline in the incidence of RA over the past 40 years may also be suggestive of a change in exposure to an environmental factor contributing to the aetiology of RA.

Duthie et al (2004) also note evidence for increasing prevalence of gout in New Zealand, which as well as genetic factors mentioned earlier (recall footnote 2) could, at least in part, be explained by demographic ageing and an increase in being overweight.

> *Gout was significantly more common in Mäori (6.4%) than Europeans (2.9%) and in Mäori men (13.9%) than in European men (5.8%). Comparison with previous studies shows that the prevalence of gout has increased in both Mäori and Europeans, particularly in men. In Mäori men the prevalence of gout has risen from 4.5-10.4% previously to 13.9%, and in European men from 0.7%-2.0% previously to 5.8%. Clinical differences included a stronger family history, earlier age at onset, and a higher frequency of tophi and polyarticular gout in Mäori than Europeans. Treatment of gout was inadequate in most cases. Of concern is that*

> *the prevalence of gout appears to be on the increase, not only in Mäori but also in Europeans in New Zealand* (Klemp et al, 1997).

Higher education and income over time may act to reduce age-specific prevalence rates to some extent. However, other factors over the longer term are more speculative. For example, new research discoveries may reduce age-specific incidence rates or delay the onset of arthritis while changes in technology (e.g. pharmacological, surgical) may improve treatments and ameliorate symptoms or even 'cure' arthritis. While these possibilities are noted, the high levels of variability surrounding them precludes their impacts from being estimated.

2 Health sector costs

There are two main methods for estimating direct health system costs.

- 'Top-down' disease cost data can be derived from central data collection agencies.
- 'Bottom-up' cost estimates use surveys, diaries and other cross-sectional or data-gathering tools to accumulate information from either a single study or multiple sources.

The advantage of the top-down methodology is that cost estimates for various diseases will be consistent, enhancing comparisons and ensuring that the sum of the parts (health system costs of each disease) does not exceed the whole (total expenditures on health care in New Zealand). The advantage of the bottom-up methodology is that it can provide greater detail in relation to specific cost elements and the same study can be extended to capture information about indirect cost elements as well as direct cost elements.

In this study, Access Economics has been limited by the lack of comprehensive data of either type in New Zealand.

- In New Zealand there is not the extensive collection of top-down disease cost data that is compiled, for example, in Australia by the Australian Institute of Health and Welfare (AIHW) from services utilisation and public and private expenditure such as hospital morbidity data, case mix data, Bettering the Evaluation and Care of Health data, the Australian National Health Survey and other sources (AIHW, 2005).
- It was not possible to source an existing comprehensive bottom-up study of cost elements of arthritis in New Zealand, although a variety of different sources exist in relation to certain elements.

Access Economics therefore utilised a process of data-gathering supplemented by targeted surveying for specific cost items. In the following sections, the sources and methodology in relation to measurement of each cost element are described in detail.

2.1 Hospital costs

In New Zealand, only public inpatient data are collected by the New Zealand Health Information Service (NZHIS). Access Economics thus used a four-step process to estimate total hospital costs.

1. Through a consultation process with specialist experts in 2005, conditions deemed to be arthritis were identified by category from the International Classification of Disease Tenth Revision (ICD-10) codes.
2. Public inpatient data were requested from NZHIS for these codes for the year 2003-04, with costs thus estimated and extrapolated to 2010 based on arthritis prevalence growth and health inflation.
3. Private inpatient costs were estimated based on the ratio of private to public joint replacement surgeries measured by the National Joint Registry.
4. Outpatient costs were estimated based on survey data cross-checked against relativities from the Australian ratio of outpatient to inpatient costs.

2.1.1 ICD-10 codes for arthritis and NZHIS data

Osteoarthritis is the most common of over 100 known forms of arthritis (see prevalence estimates in Chapter 1), while rheumatoid arthritis, systemic lupus erythematosus (SLE) and gout are also very common. Other forms include fibromyalgia, juvenile arthritis, ankylosing spondylitis, spondyloarthritis, psoriatic arthritis, scleroderma, bursitis, tendonitis, carpel tunnel syndrome, polymyalgia rheumatica, and dermatomyositis.

In consultation with a group of three specialist expert rheumatologists (two from New Zealand and one from Australia) and the New Zealand Health Information Service (NZHIS), a list of conditions deemed to be arthritis were identified by category from the International Classification of Disease Tenth Revision (ICD-10) codes. In some cases, proportions of each category were allocated as arthritic, in accordance with the clinical experience of the experts. These codes were then allocated as either 'osteoarthritis', 'rheumatoid arthritis' or 'other arthritis'. The agreed categorisation is presented in Table 2.1. Access Economics notes that it would be desirable for a widely agreed list of ICD-10 arthritic conditions to be endorsed at international level, for which the list agreed in this study might provide a useful starting point.

Public inpatient data were purchased from the NZHIS, which provided details of 25,591 admissions where the agreed arthritic codes were one of 20 diagnoses for admission. To avoid overstating or double counting of arthritic conditions, only the primary diagnosis was used in the costing (11,827 admissions). Access Economics notes that these data are rich in the ability to identify co-morbid conditions.

Data were used where the discharge date was from 1 July 2003 to 30 June 2004, and Access Economics limited the length of stay to 365 days in order to accurately achieve an *annual* cost estimate. This entailed scaling down the large raw data cost-weights for six admissions by the extent they were over 365 days.

- Average length of stay was 5.2 days after scaling down (5.6 days without).

Other information in the data included patient age, gender, ethnicity, cost-weight and facility type[4], among other variables.

- Data were provided by year of age, which Access Economics grouped as 0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84 and 85+.
- Ethnicity was grouped into Mäori (comprising New Zealand Mäori and Cook Islands Mäori, categories 21 and 32) and non-Mäori (all other categories).

The cost-weight for each stay is calculated via a complex algorithm which takes account of length of stay as well as other issues related to cost complexity of admissions (District Health Boards of New Zealand, 2003).

- The cost-weight multiplier converts the cost-weight to a dollar amount; in 2003-04 the multiplier was $2,728.55 for medical/surgical inpatients.

[4] While most public inpatient services are provided in public hospitals, some are provided in private hospitals and a very few in facilities classified as health centres.

Table 2.1: Classification of arthritis, ICD-10 codes

Code	ICD-10 Descriptor	% Arthritic	Osteo-arthritis	Rheumatoid arthritis	Other arthritis
M00	Pyogenic arthritis	100%	-	-	100%
M01	Direct infections of joint in infectious and parasitic diseases classified elsewhere	100%	-	-	100%
M02	Reactive arthropathies	100%	-	-	100%
M03	Postinfective and reactive arthropathies in diseases classified elsewhere	100%	-	-	100%
M05	Seropositive rheumatoid arthritis	100%	-	100%	-
M06	Other rheumatoid arthritis	100%	-	100%	-
M07	Psoriatic and enteropathic arthropathies	100%	-	-	100%
M08	Juvenile arthritis	100%	-	30%	70%
M09	Juvenile arthritis in diseases classified elsewhere	100%	-	-	100%
M10	Gout	100%	-	-	100%
M11	Other crystal arthropathies	100%	-	-	100%
M12	Other specific arthropathies	100%	-	-	100%
M13	Other arthritis	100%	50%	-	50%
M14	Arthropathies in other diseases classified elsewhere	100%	-	-	100%
M15	Polyarthrosis	100%	-	50%	50%
M16	Coxarthrosis [arthrosis of hip]	100%	100%	-	-
M17	Gonarthrosis [arthrosis of knee]	100%	100%	-	-
M18	Arthrosis of first carpometacarpal joint	100%	100%	-	-
M19	Other arthrosis	100%	100%	-	-
M30	Polyarteritis nodosa and related conditions	30%	-	-	30%
M31	Other necrotizing vasculopathies	30%	-	-	30%
M32	Systemic lupus erythematosus	100%	-	-	100%
M34	Systemic sclerosis	7.5%	-	-	7.5%
M35.0	Sicca syndrome [Sjögren]	20%	-	-	20%
M35.1	Other overlap syndromes	20%	-	-	20%
M35.3	Polymyalgia rheumatica	100%	-	-	100%
M45	Ankylosing spondylitis	100%	-	-	100%
M46	Other inflammatory spondylopathies	100%	-	-	100%
M47	Spondylosis	100%	80%	-	20%
M48.0	Spinal stenosis	100%	80%	-	20%
M48.1	Ankylosing hyperostosis [Forestier]	100%	100%	-	-
M49	Spondylopathies in diseases classified elsewhere	100%	-	-	100%
M65	Synovitis and tenosynovitis	100%	-	-	100%
M68	Disorders of synovium and tendon in diseases classified elsewhere	100%	-	-	100%

M70.0	Crepitant synovitis (acute) (chronic) of hand and wrist	100%	-	-	100%
M71.2	Synovial cyst of popliteal space [Baker]	100%	-	-	100%
M75.0	Adhesive capsulitis of shoulder	100%	-	-	100%
M76	Enthesopathies, lower limb, excluding foot	100%	-	-	100%
M77.2	Periarthritis of wrist	100%	-	-	100%
M77.3	Calcaneal spur	100%	-	-	100%
M77.5	Other enthesopathy of foot	100%	-	-	100%
M77.8	Other enthesopathies, not elsewhere classified	100%	-	-	100%
M77.9	Enthesopathy, unspecified	100%	-	-	100%

Source: New Zealand Health Information Service and specialist expert consultation.

2.1.2 Public inpatient costs

Table 2.2 summarises the results from the NZHIS public inpatient data.

Table 2.2: Arthritis public inpatient costs by ICD-10 code, 2003-04

Code	ICD-10 Descriptor	Osteo. $m	Rheum. $m	Other $m	Total $m	% Total
M16	Coxarthrosis [arthrosis of hip]	29.122	-	-	29.122	39.8%
M17	Gonarthrosis [arthrosis of knee]	22.949	-	-	22.949	31.3%
M00	Pyogenic arthritis[5]	-	-	3.453	3.453	4.7%
M48.0	Spinal stenosis[6]	2.360	-	0.590	2.950	4.0%
M06	Other rheumatoid arthritis	-	2.560	-	2.560	3.5%
M10	Gout	-	-	2.488	2.488	3.4%
M19	Other arthrosis	2.063	-	-	2.063	2.8%
M13	Other arthritis	0.568	-	0.568	1.136	1.6%
M47	Spondylosis	0.869	-	0.217	1.086	1.5%
M65	Synovitis and tenosynovitis	-	-	1.047	1.047	1.4%
M46	Other inflammatory spondylopathies	-	-	0.949	0.949	1.3%
M05	Seropositive rheumatoid arthritis	-	0.597	-	0.597	0.8%
M35.3	Polymyalgia rheumatica	-	-	0.411	0.411	0.6%
M31	Other necrotizing vasculopathies	-	-	0.355	0.355	0.5%
M08	Juvenile arthritis	-	0.097	0.226	0.323	0.4%

[5] Pyogenic arthritis, also known as infectious or septic arthritis, is a serious infection of the joints characterized by pain, fever, chills, inflammation and swelling in one or more joints, and loss of function in those joints. It is considered a medical emergency because of the damage it causes to bone as well as cartilage, and its potential for creating septic shock, which is a potentially fatal condition.

[6] Spinal stenosis is mostly a complication of degenerative arthritis, with narrowing of spaces in the spine (backbone) that results in pressure on the spinal cord and/or nerve roots. Pressure on the lower part of the spinal cord or on nerve roots branching out from that area may give rise to pain or numbness in the legs. Pressure on the upper part of the spinal cord (that is, the neck area) may produce similar symptoms in the shoulders, or sometimes the legs.

Code	ICD-10 Descriptor	Osteo. $m	Rheum. $m	Other $m	Total $m	% Total
M45	Ankylosing spondylitis	-	-	0.258	0.258	0.4%
M11	Other crystal arthropathies	-	-	0.223	0.223	0.3%
M32	Systemic lupus erythematosus	-	-	0.216	0.216	0.3%
M15	Polyarthrosis	-	0.085	0.085	0.169	0.2%
M76	Enthesopathies, lower limb, excluding foot	-	-	0.161	0.161	0.2%
M71.2	Synovial cyst of popliteal space [Baker]	-	-	0.115	0.115	0.2%
M18	Arthrosis of first carpometacarpal joint	0.114	-	-	0.114	0.2%
M75.0	Adhesive capsulitis of shoulder	-	-	0.113	0.113	0.2%
M12	Other specific arthropathies	-	-	0.088	0.088	0.1%
M70.0	Crepitant synovitis (acute) (chronic) of hand and wrist	-	-	0.071	0.071	0.1%
M30	Polyarteritis nodosa and related conditions	-	-	0.057	0.057	0.1%
M77.9	Enthesopathy, unspecified	-	-	0.043	0.043	0.1%
M02	Reactive arthropathies	-	-	0.037	0.037	0.0%
M77.5	Other enthesopathy of foot	-	-	0.025	0.025	0.0%
M34	Systemic sclerosis	-	-	0.021	0.021	0.0%
M35.0	Sicca syndrome [Sjögren]	-	-	0.016	0.016	0.0%
M77.3	Calcaneal spur	-	-	0.013	0.013	0.0%
M48.1	Ankylosing hyperostosis [Forestier]	0.004	-	-	0.004	0.0%
M77.8	Other enthesopathies, not elsewhere classified	-	-	0.003	0.003	0.0%
	TOTAL $m	**58.05**	**3.34**	**11.85**	**73.24**	**100%**
	% Total	**79.3%**	**4.6%**	**16.2%**	**100%**	

Source: New Zealand Health Information Service special data purchase.

Total public inpatient costs for arthritis in 2003-04 were $73.24m.

- Osteoarthritis was responsible for 79.3% of public inpatient costs, rheumatoid arthritis for 4.6% and other arthritis for 16.2% of costs.
- Osteoarthritis of the hip and knee alone accounted for over 70% of costs.

To extrapolate the $73.24m estimate to 2010, it is multiplied by two factors, totalling 36.4% over the 6½ years.

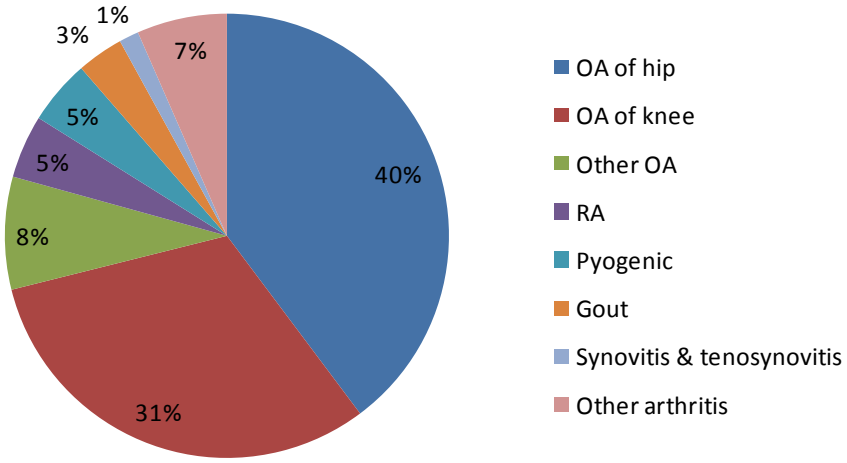
- Health cost inflation, estimated at 2.9% per annum or 18.7% in total between 2003-04 financial year and calendar year 2010[7]; and
- Growth in prevalence of arthritis of **14.9%** between 2003-04 and 2010 (based on prevalence rates by age, gender and ethnicity multiplied by the population estimates for

[7] Health cost inflation data were not provided by NZHIS. Average health cost inflation of 2.9% per annum was thus based on Access Economics (2005a).

the respective years). The implicit assumption is that services expanded in line with prevalence.

- Public inpatient costs are thus estimated to be **$99.9m in 2010**. Figure 2.1 depicts the shares by major types of arthritis.

Figure 2.1: Public inpatient costs by type of arthritis, 2010 (share of $99.9m)



Source: Access Economics based on NZHIS data.

Figure 2.2: Arthritis public inpatient costs by age and gender, $m, 2005

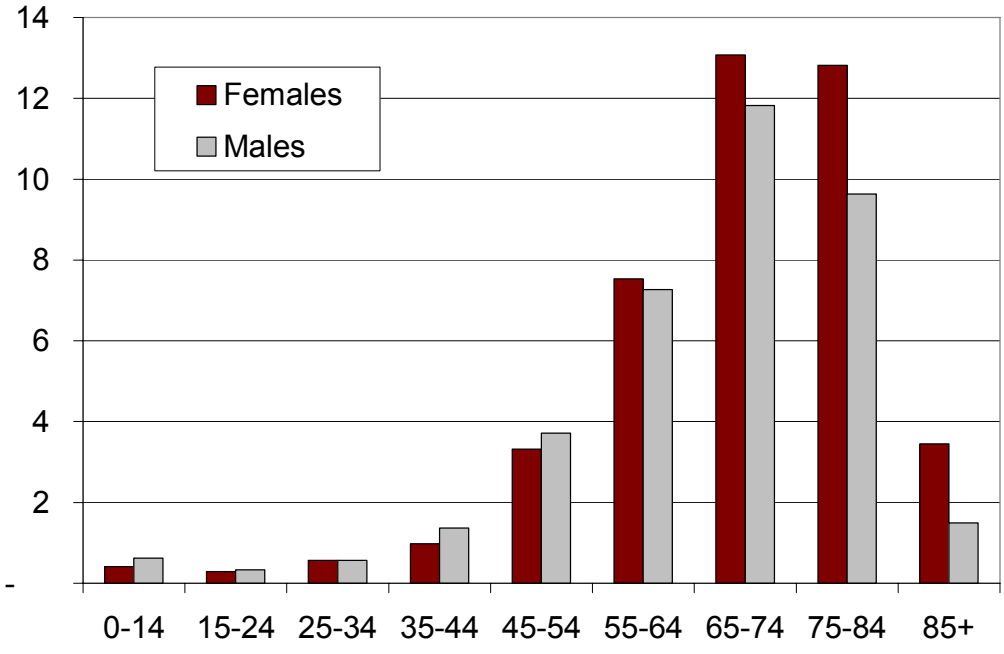


Figure 2.2 and Table 2.4 present public inpatient data by age and gender for 2010.

- 53.5% of inpatient costs are for women and 46.5% for men.
- Over a third of inpatient costs (34.5%) are for people aged over 75 years and nearly another third (31.4%) are for those aged 65-74 years.

Table 2.3: Arthritis public inpatient costs by age and gender, $m, 2010

Age group	$m			% of total		
	Females	Males	Persons	Females	Males	Persons
0-14	0.54	0.80	1.34	1.0%	1.7%	1.3%
15-24	0.51	0.44	0.95	1.0%	0.9%	1.0%
25-34	0.80	0.71	1.50	1.5%	1.5%	1.5%
35-44	1.33	1.73	3.07	2.5%	3.7%	3.1%
45-54	4.20	4.66	8.86	7.8%	10.1%	8.9%
55-64	9.45	9.10	18.55	17.6%	19.7%	18.6%
65-74	16.48	14.80	31.29	30.7%	32.1%	31.3%
75-84	16.07	12.06	28.13	29.9%	26.1%	28.2%
85+	4.32	1.86	6.19	8.0%	4.0%	6.2%
Total	**53.70**	**46.18**	**99.88**	**53.8%**	**46.2%**	**100.0%**

Table 2.4 presents the public inpatient data by ethnicity and facility.

- 9.3% of total inpatient costs were for Māori people and 90.7% for non-Māori people (recalling overall prevalence or arthritis for Māori people was 9.4% of total arthritis prevalence).
- 93.3% of public inpatient services were performed in public hospitals and 6.7% in private hospitals.
- The relative shares in public and private hospitals were not significantly different between Māori and non-Māori people.

Table 2.4: Public inpatient costs by ethnicity and facility, $m, 2010

Facility	Non-Māori	Māori	Total	% Total
Public hospital ($m)	84.5	8.6	93.1	93.3%
% total	90.7%	9.3%	100.0%	
Private hospital ($m)	6.0	0.8	6.8	6.7%
% total	89.8%	10.2%	100.0%	
Total ($m)	90.5	9.4	99.9	100.0%
% total	**90.7%**	**9.3%**	**100.0%**	

Source: NZHIS data. The proportion of inpatients in health centres was negligible.

2.1.3 Private inpatient costs

Estimates of private inpatient costs were based on the ratio of private to public joint replacements from the National Joint Registry, operated by the New Zealand Orthopaedic Association at Christchurch Hospital, which showed 54.8% of joint replacements were performed in public hospitals and 45.2% in private hospitals (Access Economics, 2005a). This triangulated well against the number of public and private hospital beds available in New Zealand (52.4% public and 47.6% private).

The estimate of private inpatient costs for 2010 is thus $82.4m, with the same age, gender ethnicity and type of arthritis splits estimated as for public inpatient costs.

Total inpatient costs (public and private) are $182.3m.

To provide triangulation for reality checking, the inpatient data per person in 2005 was compared to similar data for Australia from Access Economics (2005) in Table 2.5.

- In 2004, inpatient costs in Australia were estimated as A$932.4m which, across the 3.37m Australians with arthritis, resulting in an estimated A$277 inpatient cost per person with arthritis. Converting to 2005 NZ dollars using Australian health cost inflation, demographic growth and purchasing power parity of NZ$1.071=A$1 (OECD, 2005) this was equivalent to NZ$313 per person with arthritis in 2005.
- The New Zealand estimate of inpatient costs per person with arthritis of NZ$279 per person in 2005 was about 89% of the Australian estimate. This fits well with data that suggest that average hospital inpatient stays in New Zealand are shorter than in Australia. For example, OECD data showed the average length of stay in New Zealand was 85% of that in Australia.
- The estimate of inpatient cost of arthritis in New Zealand of $182.3m in 2010 thus appears robust.

Table 2.5: Triangulation of inpatient data

NZ	**2003-04**	**2005**
Costs $m	134.5	145.6
Prevalence (people)		521,969
Cost/person NZ$		**279**
Australia	**2004**	**2005**
Inpatient costs A$m	932.4	
Prevalence (people)	3,367	
Cost/person A$	**277**	**292**
Cost/person NZ$		**313**

Source: Access Economics.

2.1.4 Outpatient costs

The fourth and final step in estimating hospital costs is estimating outpatient costs, where a combination of survey and triangulated top-down data was used.

Survey data for outpatients were sought by contacting all the District Health Boards with a brief questionnaire (see Appendix D) in 2005. The DHBs were asked what outpatient services they provided and, for specialist and allied health services, they were asked how many hours of services were provided to people with arthritis who were not inpatients, for their arthritis, and the average cost of these services.

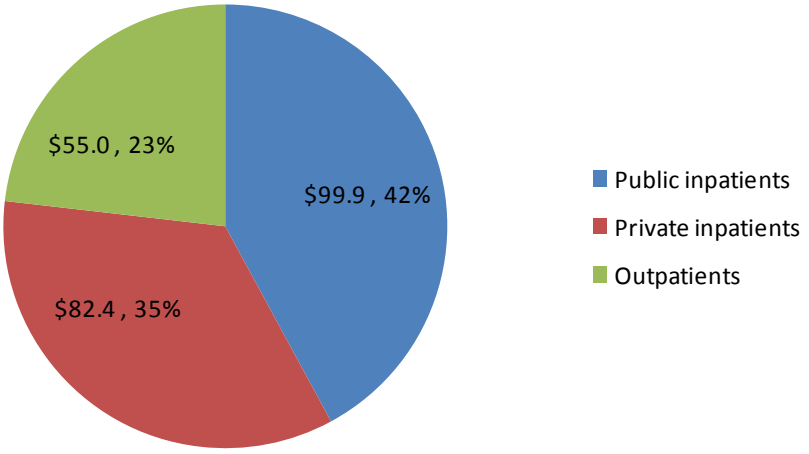
A problem encountered and expressed by DHBs was that they do not code by disease within non-admitted patient systems so have no way of separating patients with arthritis from those without, while noting that patients with arthritis access their services, particularly in relation to follow-up from joint replacement surgery. As such only one DHB was able to respond with data estimates, inadequate for statistical use but the return is summarised below for interest.

- Specialist medical services, physiotherapy and occupational therapy services were provided as outpatient services for people with arthritis in 2005 through the DHB.
- For specialist services, 750 outpatient hours were estimated to be provided to treat arthritis at an average cost of $245 per hour.
- For allied health services, 1,250 physiotherapy hours and 600 occupational therapy hours were provided at an average cost of $60 per hour.
- The share of beds in this DHB outpatient facility was 0.7% of the total number of beds in New Zealand, with the total estimated as 49,214 beds for 2005 based on modest actual average annual growth rate of 0.5% over the period 1993-2002 projected to 2003-2005.
- A ballpark estimate from these data would imply $25.8m for outpatient specialist services across New Zealand and $15.6m for outpatient allied health services - $41.4m in all.

Greater confidence in an outpatient cost estimate was deemed to be derived by using the ratio of outpatient to inpatient costs from AIHW data, since clinical practice at the tertiary care level is quite similar in New Zealand and Australia. Outpatient costs were thus estimated as 32.0% of inpatient costs or $46.5m in 2005 (Access Economics, 2005a). The average of this and the ballpark estimate of $41.4m above was then taken as the estimate of outpatient costs in New Zealand i.e. $44.0m. Factoring these relative calculations to 2010 provides an estimate of outpatient costs in 2010 of **$55.0m.**

Altogether hospital costs for arthritis are thus estimated as $237.3m.

Figure 2.3: Hospital costs arthritis, NZ, 2010 ($m and % total of $237.3m)



2.2 General practice costs

2.2.1 GP services attributable to arthritis

Data were purchased from the Royal New Zealand College of General Practitioners Research Unit, based at the Department of General Practice, University of Otago, in 2005 to estimate the number of GP consultations for people with arthritis, as well as medications prescribed and referrals, for the year 2003.

A total of 323,975 consultations (N) with coded diagnoses (read codes) were recorded for all patients in the database in 2003. These consultations represented 131,343 different individuals (58,455 males, 72,842 females and 46 with gender not recorded).

Of the total coded consultations, 8,551 (2.64%) were identified that included at least one Arthritis read code during 2003 (n). This represented 5,047 different individuals (1,851 males and 3,196 females). A matrix of managed conditions in addition to arthritis is presented in Table 2.6. 36% were for arthritis only, while 25.7% were for arthritis and one other condition, 16.6% were for arthritis and two other conditions, and 21.7% were for arthritis and three or more other conditions.

- The 3,076 'arthritis only' consultations represented 2,335 individuals (865 males and 1,470 females).
- 5,113 or 59.8% of the 8,551 consultations were estimated to be attributable to arthritis (3,076+2,199/2+1,422/3+1,854/4) – thus 1.58% (5,113/323,975) of all GP consultations in New Zealand were attributable to arthritis (the 'attributable fraction').

Table 2.6: Consultations for arthritis, by other problems managed, 2003

Consultations	Number	% Total
(a) Arthritis only consultation	3,076	36.0%
(b) Arthritis + 1 additional read code	2,199	25.7%
(c) Arthritis + 2 additional read codes	1,422	16.6%
(d) Arthritis + 3 or more additional read codes	1,854	21.7%
(b) + (c) + (d) No. of Arthritis consults with additional read codes	5,475	64.0%
(a) + (b) + (c) + (d) Total No. of Arthritis consults (n)	8,551	100.0%

Source: RNZCGPRU.

Thus RNZCGPRU data provides surprisingly low estimates relative to similar Australian data from Bettering the Evaluation and Care of Health (BEACH), which are nearly four times higher – suggesting 5% of GP visits are due to arthritis. As such, because of coding inconsistencies related to the RNZCGPRU data[8] and the relatively small sample size (less than 2%), Access Economics (2005a) adopted an average of the two as the estimate of the attributable fraction – **3.7%**.

The NZHS also found that the mean number of GP visits per annum was 4.0 (95% confidence interval 3.8–4.1) and 8 out of 10 people had visited a GP in the past year.

- This suggested, based on 2005 population data, that overall there would be 16,383,920 GP visits in New Zealand in 2005.
- Access Economics notes that this is a much lower rate of visiting GPs overall than in Australia, where average visits per annum per capita exceed 5, although this may relate to relatively tighter funding (Malcolm, 2004).

[8] The RNZCGPRU database is comprised of raw data as entered at the time of encounter and thus is subject to error due to incomplete field entries by the provider, as they are not required to code and do it of their own accord. RNZCGPRU note that the discrepancy is likely to relate to doctors not consistently coding all managed problems as well as omitting codes for most (80%) of consultations.

- On the basis of the NZHS data, **608,260 GP visits in 2005 in New Zealand were estimated as attributable to arthritis**.

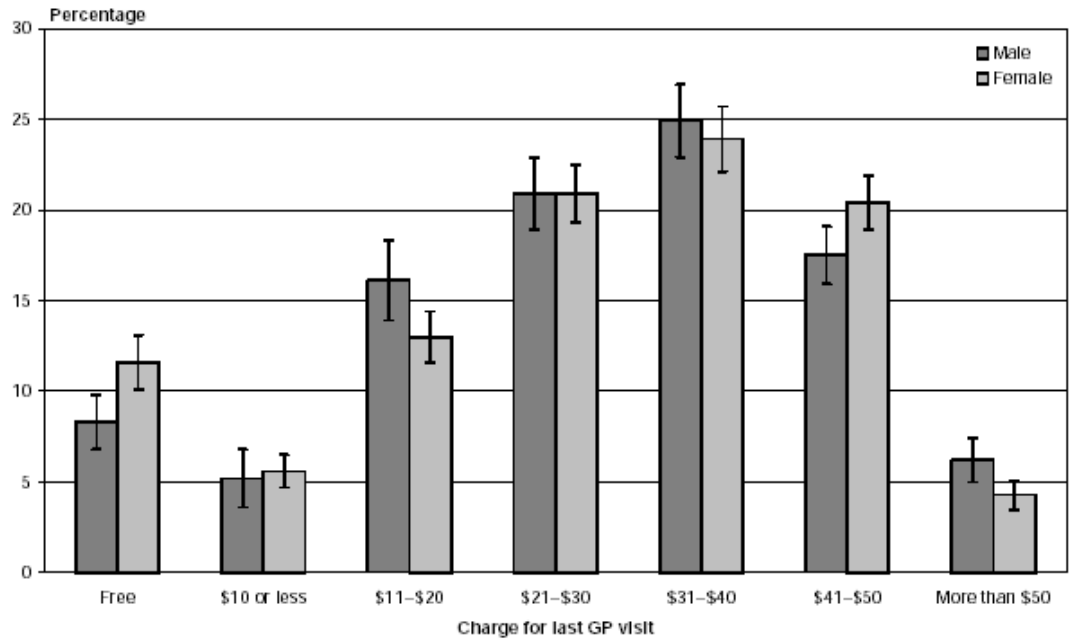
2.2.2 GP costs

The New Zealand Health Survey (NZHS) contains data on General Practitioner costs, noting:

- Overall, the most common charge for the last GP visit was in the range $31 to $40. One in 10 adults (9.3%; with a 95% confidence interval of 8.3% to 10.3%) was not charged for their last GP visit, while one in 20 adults (5.0%; with a 95% confidence interval of 4.4% to 5.7%) was charged more than $50.

These distributional data were used to identify the mean cost of a GP consultation in 2003 as $27.87 (Figure 2.4).

Figure 2.4: Cost of last visit to general practitioner, by gender



Source Ministry of Health (2004a). Aged 15 and over. Age-standardised.

Thus the 608,260 visits for arthritis at $29.93 per visits implied total arthritis-related GP costs in 2010 were $18.2m. Extrapolating this to 2010 based on prevalence growth and health cost inflation suggests that **total arthritis-related GP costs in 2010 are $22.8m.**

This is lower than would be expected from Australian data but is explainable in relation to:

- lower unit costs for GP visits in NZ;
- fewer visits per person overall in NZ;
- a lower apparent attributable proportion of GP visits in NZ to arthritis relative to other conditions.

That said, the **estimate of GP costs it is likely to be conservative, given the small sample size in the RNZCGPRU data**.

2.3 Pharmaceutical costs

In 2005, pharmaceutical costs for arthritis in NZ were estimated primarily by utilising price and quantity data purchased from IMS Health to estimate total costs for prescribed and over-the-counter drugs for arthritis, with a total estimate of $40.5m. Dosages of different types of pharmaceuticals prescribed using the RNZCGPRU data were also presented for comparison in Access Economics (2005a).

2.3.1 Prescription drugs

For this more recent estimate of pharmaceutical costs, data on prescription drugs were sourced from a special data request to PHARMAC in late 2009, supplemented by data available in the public domain. The most commonly prescribed drugs to treat arthritis that PHARMAC funds are summarised in Table 2.7.

Table 2.7 Most commonly prescribed arthritis drugs funded by PHARMAC (2009)

Chemical name	Drug cost ex-GST	Dispensings
adalimumab (Humira)	$12,537,343	6,619
leflunomide (Arava*)	$2,057,279	22,320
diclofenac sodium (Voltaren*)	$1,944,310	640,953
etanercept (Enbrel)	$1,633,644	881
ibuprofen (Brufen*)	$1,369,086	523,202
hydroxychloroquine sulphate (Plaquenil)	$702,463	33,056
naproxen sodium (Synflex*)	$635,277	102,782
naproxen (Naprosyn*)	$604,152	90,797
tenoxicam (Tilcotil)	$416,965	41,900
indomethacin (Arthrexin*)	$162,461	22,856
penicillamine (D-Penamine)	$69,491	890
sodium aurothiomalate (Myocrisin)	$55,373	1,281
ketoprofen (Oruvail)	$40,829	5,472
piroxicam (Piram-D)	$26,046	9,969
sulindac (Daclin)	$18,155	3,065
tiaprofenic acid (Surgam)	$15,171	2,082
auranofin (Ridaura)	$11,424	176
Total	**$22,299,469**	

Agents shaded in the table are used solely for arthritis (adalimumab, leflunomide, etanercept, penicillamine, sod aurothiomalate, auranofin). Adalimumab spending is probably overstated due to a risk sharing agreement between the sponsor and PHARMAC, which involves rebates paid by the sponsor once Government spending reaches a certain level.

The remaining agents are non-steroidal anti-inflammatory drugs (NSAIDs), except hydroxychloroquine, and are used for numerous indications. The manufacturer of ketoprofen believes the majority of prescriptions are for arthritis (personal communication, January 2010).

NSAIDs

Indomethacin has been discontinued. The (most frequently prescribed) 25mg and 50mg capsules ran out of stock in February/March 2009. 75mg long-acting tablet and suppositories stocks have not yet been exhausted.

Ketoprofen, sulindac and tiaprofenic acid are partially funded NSAIDs so PHARMAC expenditure only reflects a proportion of expenditure. Patient co-payments meet the shortfall between subsidy and manufacturer price plus pharmacist mark up. For partly-subsidised medicines, the final price consumers pay depends on the difference between the subsidy and the manufacturer's price, and the size of the mark-up the dispensing pharmacy charges. The ketoprofen difference (between subsidy and manufacturer) was $14.84 for 100mg and $29.68 for 200mg. According to the manufacturer, sales for each strength are approximately equivalent. For Sulindac, the extra amount is $6.68 for 100mg and $13.28 for 200mg, and the manufacturer advised that: '40% of volume sold is the 100mg and 60% the 200mg'. Tiaprofenic acid comes in one strength only, 300mg, where the extra amount is $15.23.

Full funding of other NSAIDs (e.g. naproxen and ibuprofen) enabled patients who were taking a particular NSAID for inflammatory arthritis when it was fully funded (i.e. prior to reference pricing) to continue to have access to the product fully funded after reference pricing was implemented.

Aside from PHARMAC spending, patients pay a $3 co-payment, pharmacists have a dispensing fee, and pharmacists add a mark up for partially funded drugs which the patient pays.

> In total, after adjusting down for NSAIDs being used for other purposes, the adalimumab rebate and the depleted indomethacin stock, and adjusting up for copayments for partly-funded drugs, mark-ups/dispensing fees, prevalence growth and health inflation to 2010, the total estimate for the cost of drugs in Table 2.7 was $31.4m of which $8.0m is estimated to be out of pocket this year.

Others drugs used to treat arthritis which are PHARMAC funded but are not in Table 2.7 since they represent a smaller market share include : azathioprine, corticosteroids e.g. prednisone, cyclosporine, methotrexate, sulphasalazine and allopurinol. The cost of the most common of these drugs was estimated based on proportionality from Access Economics (2005a:Table C-1, repeated in Appendix C of this report) as $2.2m in 2010.

Other prescription products used for arthritis which are not reimbursed include the COX-2 inhibitors and the biologics.

COX-2s

Cyclooxygenase 2 inhibitors are not listed on the schedule of pharmaceutical benefits. Rofecoxib (Vioxx) and Lumiracoxib (Prexige) have been discontinued. Currently there are two COX-2 inhibitors prescribed in NZ, celecoxib (Celebrex) and etoricoxib (Arcoxia). Only the cost associated with Celebrex was able to be provided by manufacturers, so the Arcoxia cost was estimated from the Celebrex cost, for a total of $3.7m.

Biologics

Etanercept (Enbrel) was first funded in New Zealand in 2004 for children with juvenile chronic (rheumatoid) arthritis. In October 2005, PHARMAC began funding adalimumab (Humira) for last line treatment of severe and active erosive rheumatoid arthritis.

The other biologics used for arthritis (and other autoimmune disorders) in New Zealand are rituximab (MabThera), infliximab (Remicade) and abatacept (Orencia). Expenditure is currently $5.5 million per year, increasing at $1 million every 6 months – 86% for infliximab. These prescription drugs are not listed on the schedule of pharmaceutical benefits and are funded by District Health Boards (DHBs). The utilisation of these other biologics is not uniform across the DHBs leading to varied patient access across the country. It is not known for what other indications the biologics are used, although manufacturers suggested they are most commonly used for gastrointestinal conditions. Adjusting for use due to other indications, the estimated cost in 2010 was $1.55m.

PHARMAC believes manufacturer negotiations will lead to a 35-40% reduction in net price of biologics, although the period of this reduction was not precisely specified.

Other prescribed agents

Chloroquine (Nivaquine) and meloxicam (Mobic) are not PHARMAC subsidised. Only the cost of meloxicam was able to be provided by manufacturers, so the Chloroquine cost was estimated from the meloxicam cost, for a total of $1.3m.

To see if this list of prescription drugs is exhaustive, and to check if any newer drugs had come onto the market we compared this with Arthritis Australia prescription list and found that all drugs had been covered. Although the estimates do not cover hospital sales, hospital spending on pharmaceuticals is included in the hospital costs.

OTC

To estimate the cost of over-the-counter (OTC) pharmaceuticals, we extrapolated the 2005 data from Access Economics (2005a). These include drugs such as paracetamol and aspirin, but may underestimate drugs sold directly from manufacturers to supermarkets or online sales, due to the way that IMS data are collected. OTC costs were thus estimated as $1.65m in 2010.

2.3.2 Summary of pharmaceutical costs

Overall the estimates of all pharmaceuticals for 2010 are summarised in Table 2.8.

The total cost of pharmaceuticals for arthritis was estimated as $41.8m in 2010.

Table 2.8 Most commonly prescribed arthritis drugs funded by PHARMAC (2009)

Chemical name	Drug cost ex-GST
adalimumab (Humira)	13,246,645
diclofenac sodium (Voltaren*)	5,426,061
ibuprofen (Brufen*)	4,199,468

Chemical name	Drug cost ex-GST
leflunomide (Arava*)	2,285,550
etanercept (Enbrel)	1,726,165
naproxen sodium (Synflex*)	1,211,006
naproxen (Naprosyn*)	1,115,058
hydroxychloroquine sulphate (Plaquenil)	914,422
tenoxicam (Tilcotil)	660,165
ketoprofen (Oruvail)	171,384
piroxicam (Piram-D)	79,973
penicillamine (D-Penamine)	77,919
indomethacin (Arthrexin*)	75,745
sodium aurothiomalate (Myocrisin)	65,101
sulindac (Daclin)	53,498
tiaprofenic acid (Surgam)	49,402
auranofin (Ridaura)	12,039
Sub-total from Table 2.7	**31,369,600**
Cox-2s	3,728,184
azathioprine and corticosteroids	2,216,399
OTC	1,651,302
biologics	1,548,760
chloroquine and meloxicam	1,304,605
Sub-total outside Table 2.7	**$10,449,250**
Total	**41,818,849**

Sources: Pharmac, Access Economics (2005a), consultation with DHBs and manufacturers.

2.4 Pathology and diagnostic imaging costs

2.4.1 Pathology

The RNZCGPRU data provided pathology referrals by type for the arthritis-related consultations and also for these same referrals in the general 2003 patient population.

Of the 3,076 consultations where arthritis was the only managed condition, 414 (13.5%) resulted in a referral for laboratory tests on the same date. This represented a total of 379 different individuals. A total of 8,616 laboratory tests were undertaken for these consultations, representing 132 different types of laboratory test and in a ratio of **2.8 tests per arthritis consultation**.

Table 2.9 shows the top 20 laboratory referrals (40% of all referrals) for the arthritis patients relative to the general population. Appendix C (Table C-2) gives results for all 132 different laboratory tests for which the arthritis patients were referred.

Table 2.9: Top 20 laboratory referrals, arthritis relative to total, 2003

Lab test type	% Difference in share	Number		% Total	
		Arthritis	Total (N-n)	% Arthritis	% Total (N-n)
Glycosylated haemoglobin	4.21	366	196	4.25	0.04
Eosinophil antibodies	3.84	343	679	3.98	0.14
Erythrocyte sedimentation rate	3.07	268	216	3.11	0.04
Rheumatoid Factor	2.15	203	1,016	2.36	0.21
Aspartate Aminotransferase	2.14	184	11	2.14	0
Gamma-glutamyl transpeptidase	2.11	182	8	2.11	0
C-Reactive Protein	1.93	227	3,402	2.63	0.7
Anti Nuclear Antibodies	0.95	91	526	1.06	0.11
Urea	0.72	216	8,678	2.51	1.79
Globulin	0.69	168	6,102	1.95	1.26
Ferritin	0.67	82	1,377	0.95	0.28
Anti-dsDNA antibodies	0.51	51	388	0.59	0.08
Mean corpuscular hemoglobin	0.46	256	12,141	2.97	2.51
Mean corpuscular volume	0.46	256	12,141	2.97	2.51
Antinuclear Antibody Test	0.41	39	174	0.45	0.04
Folate	0.37	41	512	0.48	0.11
Leukocytes	0.24	371	19,693	4.31	4.07
Antibody	0.21	20	80	0.23	0.02
antibody test – RNP	0.21	20	79	0.23	0.02
antibody test - SCL-70	0.21	20	82	0.23	0.02

Source: RNZCGPRU. (Fasting status was returned in the top 20 but deleted as it is an information code rather than a costed service.)

Using the data from RNZCGPRU for the number of arthritis consultations, it was estimated there were 1,703,760 tests in 2005.

The average price for these top 20 referrals was based on telephone calls to a sample of major New Zealand pathology providers. The estimated average price of the tests was $10.84, giving a total cost in 2005 of $18.5m. This was some 50% higher than expectations, but reasonably so since pathology is provided through multiple funding methods by both the public and private sectors, so there can be incentives that increase relative volumes and costs for pathology in New Zealand (France et al, 2003).

Inflating by prevalence and health inflation, the estimate for **pathology costs for arthritis in 2010 is thus $23.2m**.

2.4.2 Diagnostic imaging

In the RNZCGPRU database, referrals for X-rays and diagnostic scans (e.g. magnetic resonance imaging) are listed with laboratory referrals in a patient record. Appendix C (Table C-2) shows that of the arthritis consultations, only one X-ray referral and six general radiology referrals were given. No referrals for scans were issued. In the general population, 498 radiology

referrals were given. This was an unexpectedly low result and a possible explanation from RNZCGPRU is that some doctors may not be using electronic methods to record X-ray and scan referrals. As such, these data were not utilised in the costing – rather, survey data were sought.

Survey data for diagnostic imaging, as with outpatients, were requested from District Health Boards through a brief questionnaire (see Appendix D). The DHBs were asked how many hours they provided diagnostic imaging services to people with arthritis in relation to their arthritis in the most recent year and the average cost per hour of the services. However, as with outpatients, the sample size was inadequately small to be of use, while noting that, of the data received, indications were that X-ray costs were approximately equivalent to those of bone scans and MRI.

The method thus used to estimate diagnostic imaging costs was based on the relative ratio of imaging to pathology from Australian data (Access Economics, 2005), where imaging costs were derived as 4.2 times the costs of pathology for people with arthritis adjusting for the high pathology estimate. The 2005 cost of $48.5m was then inflated by prevalence and health inflation to 2010.

The estimate for diagnostic imaging in 2010 is thus $60.6m and the cost for pathology and imaging together is $83.7m.

2.5 Research costs

There were no data available on overall expenditure (private and public sector) on health and medical research by disease/condition in New Zealand. The approach adopted in 2005 was thus to:

1. estimate public sector expenditure from data supplied by the Health Research Council of New Zealand (HRC); and
2. estimate private sector expenditure from OECD estimates of NZ relativities.

HRC undertook a search for research projects that it had sponsored based on the search terms:

- arthritis;
- arthritic;
- arthrosis;
- arthropathy/ies;
- ankylosing;
- spondylosis;
- spondylopathy/ies;
- synovitis;
- tenosynovitis;
- osteoarthritis;
- rheumatoid;
- systemic lupus; and

- gout.

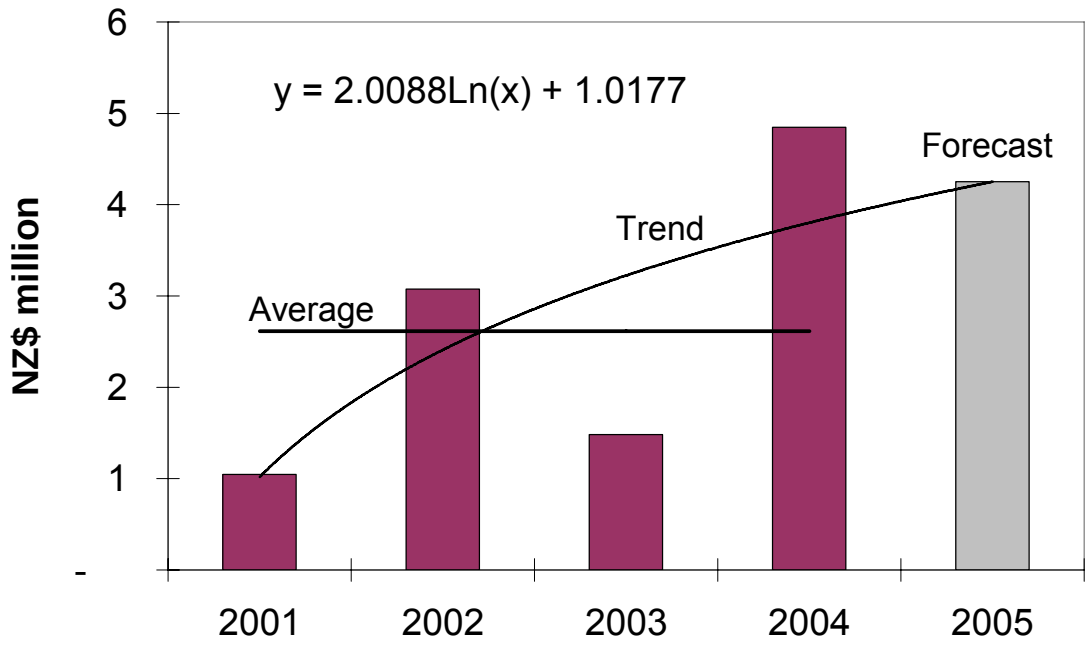
A list of the ICD-10 codes used to define arthritis assisted with the search. Projects were requested to include applied research as well as 'basic' or 'developmental' level research that would also provide primary benefits to people with arthritis – for example, studies of inflammatory processes, or public health/management studies to educate or assist people in the management of their arthritis. Projects identified for the years 2001-2004 are summarised in Table 2.10, with a total cost of $10.5m over the four years and an average cost of $2.6m.

Table 2.10: HRC Research projects relating to arthritis, 2001-2004, $

Year	Title	$
2004	Comparative mapping in human and mouse to characterise the IDDM6 autoimmune disease locus	$1,558,149
2004	Viral virulence and pathogenicity: Multi-component manipulation of host physiology	$3,290,558
2003	Genetics of Rheumatoid Arthritis and Gout in New Zealand Mäori	$102,550
2003	Development of mesenchymal stem cell therapies in a cartilage repair model	$1,381,308
2002	Oxidants, antioxidants and inflammatory diseases	$1,922,000
2002	Biomechanical vulnerability of the joint tissues with respect to maturity and degree of degeneration	$396,253
2002	Identification of a novel obesity gene	$758,335
2001	Chromosome 18 and susceptibility to autoimmune disease	$1,045,624
Total		$10,454,778
Average		**$2,613,694**

The HRC-sponsored research increased from 2001 to 2005, with trend growth illustrated in Figure 2.5.

Figure 2.5: HRC research projects relating to arthritis, 2001-2004, $m



Extrapolating trend growth to 2005 provided our estimate of public-funded research for 2005. The trend growth curve approximates y = 2Ln(x) + 1; for 2005 the estimated public research spending on arthritis was $4.25m. Inflating this to 2010 based on prevalence and health inflation provides an estimate for public arthritis R&D in 2010 of **$5.3m**.

The private sector research spend estimate was based on proportionality from a 12-country comparison by the OECD of health R&D in New Zealand and other member countries (OECD, 2004). This study showed the ratio of private health R&D in NZ as 1.33 times public health R&D, with private arthritis R&D in 2005 estimated as $5.67m. Inflating this to 2010 based on prevalence and health inflation provides an estimate for private arthritis R&D of **$7.1m, and for total arthritis R&D of $12.4m in 2010**. Arthritis New Zealand's contribution to private sector research on arthritis in the last three years was $696,171.

2.6 Other costs from survey data

As noted above, survey methods and questions are provided at Appendix D.

2.6.1 Specialist costs

As at October 2003, there were an estimated 251,211 people per rheumatologist in New Zealand, lower than published recommendations, international service provision and lower than the level found in a 1999 New Zealand survey (Harrison, 2004). By 2005, this rate equated to (only) 16.3 full time equivalent rheumatologists in the country.

Seven of the ten rheumatologists surveyed responded to the questionnaire regarding hours worked in the non-hospital sector (to avoid double-counting with outpatient costs) and costs per hour. Due to the small sample size, for confidentiality reasons these data were not

presented. Extrapolating these data to the population, estimated non-hospital rheumatology costs in 2005 are only $2.8m.

The Medical Council of New Zealand (2005) estimated that there were 230 orthopaedic surgeons in the New Zealand workforce in 2003. However, the New Zealand Orthopaedic Association provided an estimate of 180 orthopaedic surgeons practising in New Zealand in 2005.

Five of the ten orthopaedic surgeons surveyed responded to the questionnaire regarding hours worked in the non-hospital sector (again to avoid double-counting with outpatient costs) and costs per hour. As with rheumatologists, due to the small sample size, for confidentiality reasons these data are not presented. Extrapolating these data to the population, non-hospital orthopaedic surgery costs in 2005 were estimated to be $21.8m.

While other specialists may treat people with arthritis outside of the hospital system, these costs are likely to be very small and were difficult to ascertain, and thus were excluded. Total medical specialist costs for people with arthritis in New Zealand were thus estimated as $24.7m in 2005. Inflating this to 2010 based on prevalence and health inflation provides an estimate for 2010 for specialists of **$30.9m in 2010**.

While noting that the sample size of 12 specialists is relatively small, the result is 32% higher than the per capita cost of medical specialists in Australia, suggesting a possibly greater reliance on specialists relative to primary care in New Zealand for treating arthritis compared to Australia, and possibly also higher relative unit costs. Alternatively, since arthritis hospital outpatient costs are estimated to be lower in New Zealand than in Australia per person, there may be a different mix of arthritis specialist services provided through outpatient or private facilities in the two countries.

2.6.2 Allied health costs

Allied health is defined in New Zealand as 'an area of health, such as pharmacy, physiotherapy and occupational therapy, most often based in the community, that does not include doctors and nurses' (Health Workforce Advisory Committee, 2003).

Allied health professionals who would treat people with arthritis for their arthritis are likely to mainly comprise physiotherapists and occupational therapists. An allowance of 33% of the total was provided for other allied health workers who may work with people with arthritis for their arthritis-related issues (e.g. social workers, psychologists). There are an estimated 1,300 registered psychologists (NZ Psychologists Board) and over 8,000 social workers (Aotearoa New Zealand Association of Social Workers).

The Physiotherapy Board of New Zealand (2004) noted that over 2,800 annual certificates to practise were distributed in the year 2003. By 2005 the Physiotherapy Board provided a verbal estimate of 2,900 practising physiotherapists.

The New Zealand Occupational Therapy Board website provides a public register of active occupational therapists, of which there were 3,018 listed in May 2005[9].

[9] See http://www.occupationaltherapyboard.org.nz/therapists.php?letter=A

Four responses were received from physiotherapists and occupational therapists surveyed regarding hours worked in the non-hospital sector (to avoid double-counting with outpatient costs) and costs per hour. Due to the small sample size, for confidentiality reasons these data are not presented. Extrapolating these data to the population, allied health costs in 2005 were estimated as $65.0m. This estimate should be treated with caution due to the small sample size. Inflating this to 2010 based on prevalence and health inflation provides an estimate for allied health costs of **$81.4m in 2010**.

2.6.3 Aged care costs

Survey responses in relation to aged care were inadequate to estimate the aged care cost element of arthritis. Proportionality from Access Economics (2005) was therefore used to estimate this element. The ratio of aged care costs to all other health costs so derived was 16.8%. Applying this to the sum of cost elements above provides an estimate of the aged care costs for people with arthritis in New Zealand in 2005 of $69.7m. Inflating this to 2010 based on prevalence and health inflation provides an estimate for allied health costs of **$87.2m in 2010**.

It is noted that this is only an approximation since either differences in the institutionalisation of people with arthritis or in relative cost structures for residential care may cause variation.

2.7 Summary of health system costs

A summary of the health system costs derived from the discussion so far in Chapter 2 is provided in Table 2.11 and Figure 2.6.

- Total 'allocated' costs are estimated to be $597.5m in 2010.
- However, this excludes around 14% costs that are not allocated in recurrent spending – namely, capital expenditures, expenditure on community health, public health programmes, health administration and health aids and appliances. Allowance is made for the unallocated component by factoring up for these costs in the manner adopted by the AIHW (AIHW, 2005) – the factor, based on Australian data and used in Access Economics (2005a) is 100/(100-14)=16.3%
- The 'unallocated' component, comprising the administrative and other items detailed above, is estimated as $98.8m in 2010 for arthritis.

Total health costs of arthritis for 2010 are thus estimated to be $695m.

- Hospital costs represent over one third of total costs (34%)
- Pathology and imaging is estimated to be 12%, while aged care and allied health are also estimated as around 12% each.

Table 2.11: Summary of health costs of arthritis, New Zealand, 2010

Health cost element	2010 $m	% total
Public inpatients	$99.9	14.4%
Private inpatients	$82.4	11.9%
Total inpatients	$182.3	**26.2%**
Outpatients	$55.0	7.9%
Total hospital	$237.3	**34.1%**
GPs	$22.8	3.3%
Pharmaceuticals	$41.8	6.0%
Pathology & imaging	$83.73	12.1%
Specialists	$30.9	4.4%
Research	$12.42	1.8%
Aged care	$87.2	12.6%
Allied health	$81.4	11.7%
Sub-total allocated	$597.5	**86.0%**
Unallocated (administrative, capital, public health etc)	$97.3	14.0%
Total	**$694.8**	**100.0%**

Figure 2.6: Summary of health costs of arthritis, New Zealand, 2010

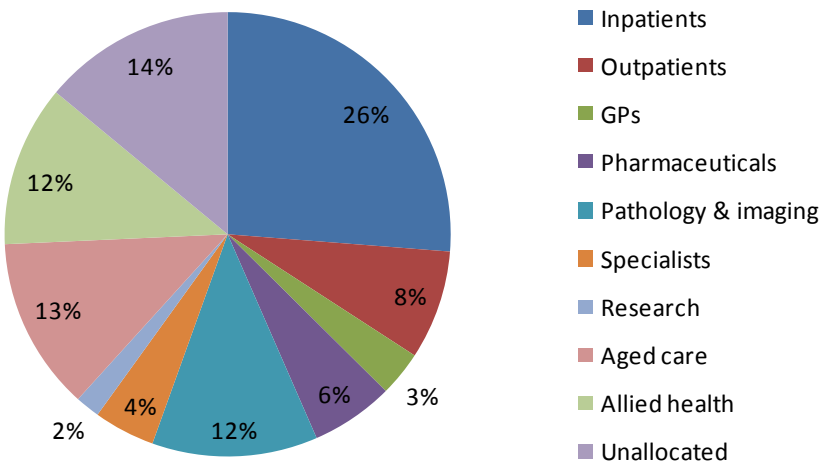


Figure 2.7 compares the relative shares of different cost items between New Zealand and Australia in 2005 (no Australian comparisons are available in 2010), highlighting less relative expenditure on hospitals, GPs and pharmaceuticals in New Zealand and higher relative expenditure on pathology and imaging, specialists and allied health. Similar trends are apparent in per capita spending for people with arthritis (Figure 2.8).

Per person with arthritis, total health spending in New Zealand was estimated to be 95% of that in Australia.

- In 2005 **health spending was $1,080 per person with arthritis** per annum (compared to NZ$1,137 in Australia). This increased to **1,310 per person with arthritis by 2010**.

- Health spending on arthritis represented **0.39% of GDP** in 2005 compared with 0.42% of GDP in Australia).[10] By 2010 this share is estimated to fall **to 0.37% of GDP.**

Figure 2.7: Share of health costs by type of cost, NZ & Australia, 2005 (% total)

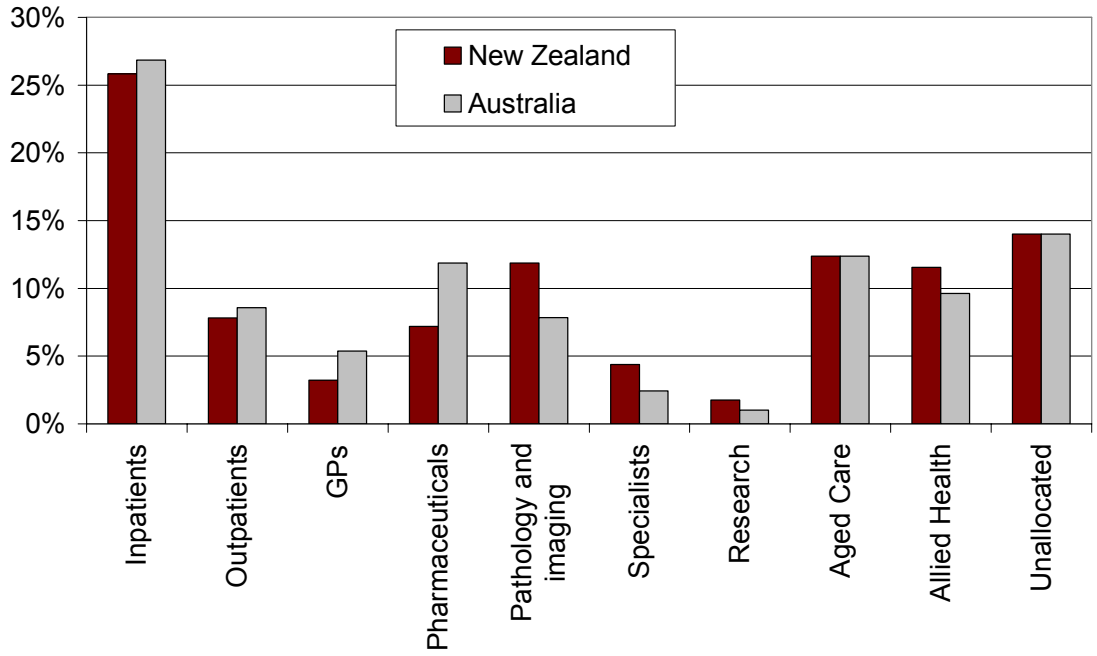
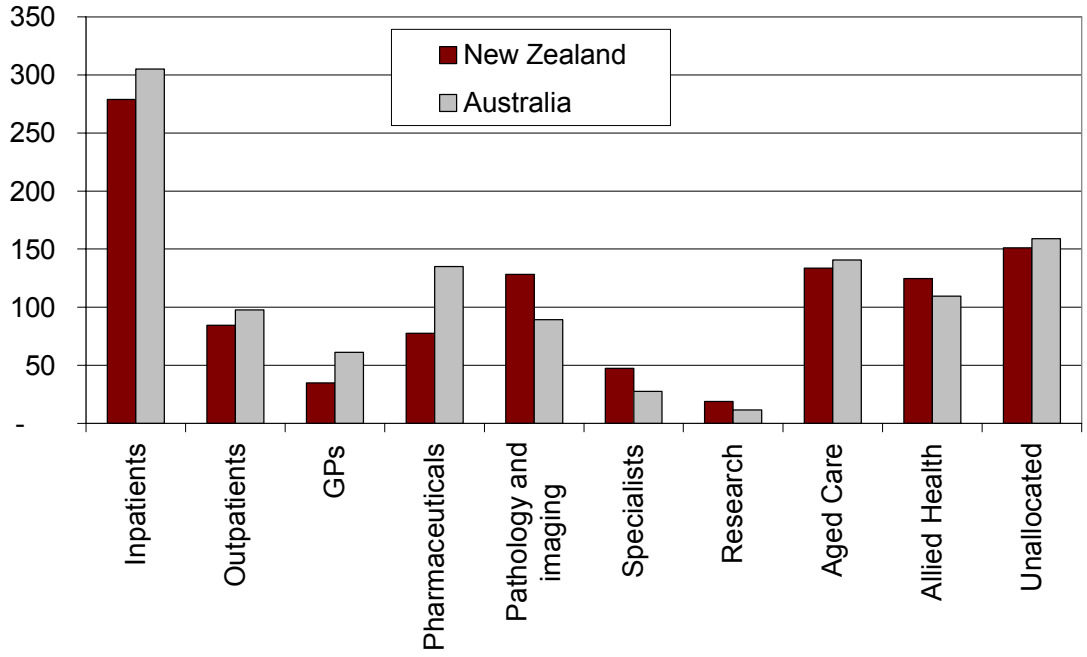


Figure 2.8: Per capita health costs by type of cost, NZ & Australia (NZ$, 2005)



[10] GDP estimate for NZ based on http://www.treasury.govt.nz/nzefo/2005/selected.asp . For Australia, Access Economics (2005).

3 Indirect costs

The World Health Organization and cost of illness studies in the past have typically classed indirect costs as all those costs that are not direct health system costs, the approach adopted here. More recently, the importance of making the economic distinction between real and transfer costs has been recognised.

- **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, or taxation revenue. These payments impact more on the distribution, rather than total level of wellbeing in society.

Transfer costs are important when adopting a whole-of-government approach to policy formulation and budgeting. Measurement of indirect costs remains a matter of some debate and controversy. In this report, we estimate **two types of indirect costs of arthritis**.

- **Financial costs** (this section) include lost production from arthritis-related morbidity and the associated deadweight taxation losses), and other financial costs e.g. carers, aids and home modifications for those disabled.
- **Non-financial costs** (Section 4) derive from loss of healthy life—the pain, premature death and loss of life quality that result from arthritis. 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 'burden of disease', with an imputed value of a 'statistical' life so as to compare these costs with financial costs of arthritis.

3.1 Productivity losses

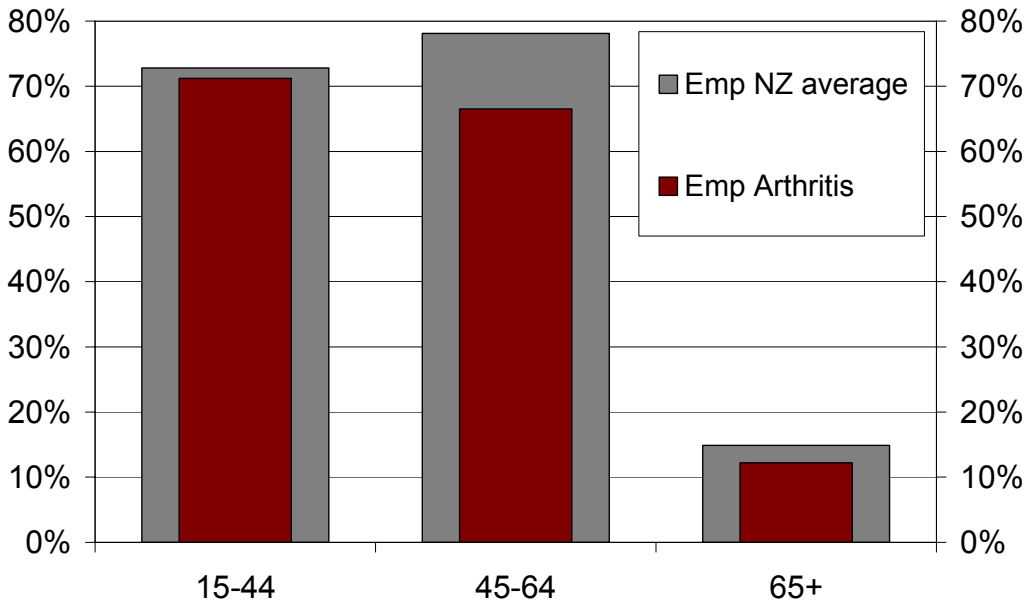
Access Economics measures the lost earnings and production due to both illness and premature death using a 'human capital' approach. The lower end of such estimates includes only the 'friction' period until the worker can be replaced, which would be highly dependent on labour market conditions and un(der)employment levels. In an economy operating at near full capacity, as New Zealand is at present, a better estimate includes costs of temporary work absences plus the discounted stream of lifetime earnings lost due to early retirement from the workforce. In this case, it is likely that, in the absence of illness, people with arthritis would participate in the labour force and obtain employment at the same rate as other New Zealanders, and earn the same average weekly earnings. The implicit and probable economic assumption is that the numbers of such people would not be of sufficient magnitude to substantially influence the overall clearing of the labour market, thus making a net addition to the productive capacity of NZ.

3.1.1 Lower workforce participation

Overall, New Zealanders with arthritis are less likely to be employed than those without arthritis. Figure 3.1 shows that rates of employment among people with arthritis are lower than for people of the same age who do not have arthritis. Moreover, for people aged 45-64, who account for around 42% of all New Zealanders with arthritis, the rate of employment is

significantly lower. These years also tend to be when people are at their most productive, receiving higher wages.

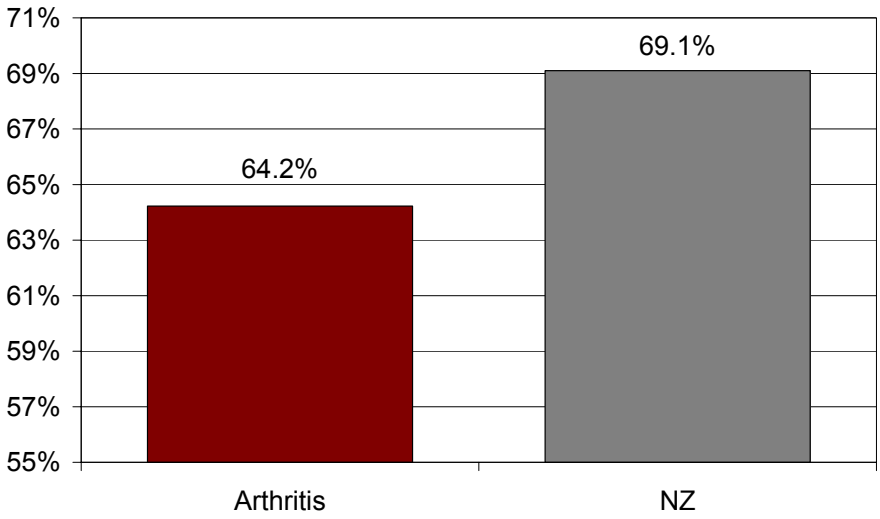
Figure 3.1: Employment rates by age, New Zealand, 2003



Source: Access Economics based on a special data request from Ministry of Health *NZHS.*

Arthritis is known to be more prevalent in female, older people and people of Mäori descent. All these groups also tend to have lower levels of workforce participation and employment than the average New Zealand population. For this reason it is necessary to standardise for the differences in age, gender and ethnic background between the two groups. As Figure 3.2 shows, when these compositional differences are accounted for, the overall rate of employment for people with arthritis is 64.2%. This is 4.9% lower than the rest of the New Zealand population at the same time. Assuming that, in the absence of arthritis, these people would obtain employment at the same rate as other New Zealanders, we can attribute the entire 4.9% difference in employment rates to the disabling effects of arthritis.

Figure 3.2: Age-standardised employment rate, NZ, 2003



In 2005, if 4.9% of people with arthritis were not working due to their arthritis, this would equate to 25,440 people. It is assumed that if they were employed, these people would, on average, earn the same average weekly earnings as other New Zealanders. In March 2005 the average weekly total earnings for a New Zealander was $794.83 (Statistics New Zealand, 2005a,b), including full-time and part-time earnings. As Table 3.1 shows, the total value of these lost earnings was estimated as $1,053.6m in 2005. Inflating this estimate by wage growth over 2005 to 2010 from the *New Zealand Income Survey*[11] and by arthritis prevalence growth over 2005 to 2010 gives an estimate of **lost earnings due to lower workforce participation in 2010 of $1.476.4m.**

Table 3.1: Cost of reduced employment, New Zealand, 2005 and 2010

	2005	2010
People not employed due to arthritis	25,440	
Average weekly earnings	$794.83	
Lost earnings due to lower workforce participation	$1,053.6m	$1,476.4m
Lost earnings due to increased absenteeism	$17.9 m	$25.1 m
Total productivity losses	**$1,071.6 m**	**$1,501.5 m**

3.1.2 Temporary work absences

As well as premature workplace separation, some people with arthritis will take temporary leave from work (e.g. for joint replacement surgery) without exiting the workplace entirely. In New Zealand, no data are collected on the level of excess temporary absenteeism resulting from arthritis. Access Economics has previously estimated, based on Australian data, that the cost of reduced earnings due to arthritis-related absenteeism is around 1.7% of the cost due to reduced workforce participation (Access Economics, 2005). If a similar ratio holds for New

[11] http://search.stats.govt.nz/nav/ct2/workincomespending_income/ct1/workincomespending/0

Zealand, **the cost of absenteeism would be $25.1 million in 2010, and total productivity losses due to arthritis will be over $1.50 billion.**

3.1.3 Taxation revenue forgone

People with arthritis who work less or retire early not only forgo income, but also pay less personal income tax. To the extent that people with lower incomes also consume a smaller set of goods and services, indirect taxes levied on consumption will also fall. While these effects would best be calculated in the context of a general equilibrium model of the economy, a partial equilibrium estimate was obtained using average tax rates in Access Economics (2005a) as follows.

Personal income tax forgone is estimated as a product of the average personal income tax rate (22%, from the Access Economics macroeconomic model) and the forgone earnings. With arthritis and lower income, there will be less consumption of goods and services, estimated up to the level of the disability pension ($193.17 per week is used, the average of single and each member of a couple's maximum adult invalid benefit rate per week, with rates from 1 April 2005 obtained from www.workandincome.govt.nz). Without arthritis, it is conservatively assumed that consumption would comprise 90% of income (the savings rate may well be lower than this). The indirect tax forgone is estimated as a product of the forgone consumption and the average indirect tax rate, proxied as the current rate of GST in New Zealand, 12.5%. This estimate of taxation forgone is conservative since the average tax rate of people with arthritis may be less than the average tax rate of people across Australia, since more of them may work part time and their average incomes (and hence marginal tax rates) may thus be lower.

Table 3.2 shows that **the potential tax revenue forgone in 2010, due to people with arthritis working less or leaving the workforce, is $330.3 million**. Of this $253.7 million (76.8%) is forgone personal income tax and the remaining $76.6 million (23.2%) is forgone indirect tax.

Lost taxation revenue is not in itself a real economic cost, but a transfer payment. Taxation payments transfer income from individual members of society to the Government who then transfers it again to other members of the community through the welfare system and government services. However, in reality these transfers are not costless to orchestrate. For example, administration of a taxation system has costs. In Australia, a comparison of the total amounts spent and revenue raised in 2000-01, relative to the Commonwealth department running costs, suggests that administration costs account for 1.25% of each taxation dollar raised (Access Economics, 2005).

Even greater costs are incurred due to the distortionary impact that taxation has on workers' work and consumption choices. Work by the Australian Productivity Commission (2003, p6.15-6.16 with rationale) found the efficiency cost (or deadweight loss – DWL) associated with these distortions amounts to 27.5% of each tax dollar. In New Zealand, studies by Diewert and Lawrence (1994, 1995, 1996) found that in 1991 the deadweight loss associated with personal income tax was 18% and for consumption taxes around 14%. They also noted that the DWLs associated with labour taxation increased from 5% to over 18% in the 20 years up to 1991.

In this report, we use the 18% for the estimate of the deadweight losses, noting that that it may be a conservative estimate in view of another study (McKeown and Woodfield, 1995) based on 1988 data that generated estimates ranging from 24.6% to 146.2% of taxes raised. Neither estimate includes possible DWLs from the taxation of income earned on capital

(appropriate in this application), or administration and compliance costs (unfortunate in this application). The use of 18% balances the upside risk that the DWLs have continued to increase since 1991 against the downside risk that tax raised from non-labour sources has lower associated DWLs.

Table 3.2 shows that **the DWL associated with the additional taxation required is $77.4m in 2010**.

Table 3.2: Cost of forgone taxation, New Zealand, 2010

Average personal income tax rate	22.0%
Potential personal income tax lost	$330.3m
Average indirect tax rate	12.5%
Potential indirect tax lost	$99.8m
Total lost tax revenue	**$430.1m**
Deadweight loss from additional taxation	18.0%
DWL from additional taxation	**$77.4m**

3.2 Informal and formal community care

A significant number of people with arthritis will receive informal care from family and friends as either a substitute for or complement to care provided through the formal health sector. However estimates of the health sector costs set out in the previous chapter include only the resources utilised by the formal sector to provide assistance to New Zealanders for their arthritis. As informal care is unpaid it is sometimes also thought of as free. However, the time devoted by a carer is time they cannot use for other activities such as paid employment or leisure activities.

It is noted that, as with the approach to production losses, this analysis is partial (rather than a general equilibrium approach) and that an implicit principle is that the economy is operating at full capacity (and therefore carer tasks are a net resource cost). In this context, there are several possible methods for valuing the time forgone by caregivers including:

- **opportunity cost**: the value of wages forgone;
- **replacement valuation**: the cost of buying a similar amount of services from the formal care sector; and
- **self-valuation**: what carers themselves feel they should be paid.

Due to the lack of information about the demographic characteristics of carers of New Zealanders with arthritis, Access Economics has first estimated the replacement valuation and from this derived an estimate of the opportunity cost valuation approach, noting that replacement valuation will always give higher results than the other two methods.

3.2.1 Hours of community care provided

In New Zealand, as in other countries, there are few robust data on the need and use of carers, by people with arthritis for their arthritis. The NZHS asked people whether they had reduced time spent, or had difficulty with regular daily activities as a result of their physical health.

Daily activities could include work, housekeeping and looking after a child or other person. Responses of people with arthritis are set out in Table 3.3.

Table 3.3: Effect of physical health on daily activities, New Zealand, 2003

Type of arthritis	Reduced time spent on activities (%)	Had difficulty performing activities (%)
Rheumatoid arthritis	32.1	46.5
Osteoarthritis	32.2	44.9
Gout	26.1	27.9
Other arthritis	32.7	37.9
All arthritis	**29.8**	**41.3**

Source: Special data request from the MoH 2003 NZHS.

A Dutch study of rheumatoid arthritis patients (Brouwer et al, 2004) found approximately 50% of patients received some level of informal care from their partner. These informal care-givers spent, on average, 27.4 hours per week providing care, comprising around 15 hours per week on household tasks such as shopping, cleaning and other household chores and 12.4 hours per week assisting the patient with the activities of daily living (ADL). Informal care was supplemented with formal assistance with household tasks in 24% of cases (around 13% of all patients) for an average of 4.5 hours per week and for ADL in 3.9% of cases (2.0% of all patients) for an average of 2.5 hours per week. In addition, 6.1% of patients receiving informal care were on a waiting list for formal care.

Using the relative need for assistance for different types of arthritis from the NZHS together with the Dutch study results, it is possible to estimate the value of formal and informal care provided to New Zealanders with arthritis in 2005. To be conservative the estimate of average time spent by informal care-givers each week is limited to hours spent providing personal care, *not* household chores. On this basis a total of **1.5m hours of formal care and 113.9m hours of informal care was estimated to be provided to New Zealanders with some form of arthritis in 2005.**

3.2.2 Value of care

The hours of care (both formal and informal) are valued at the average hourly cost of employing a person to work as a carer, including a loading for employee on-costs, administration and capital overheads. Access Economics estimates the hourly cost for a worker in Australia is A$25.01 per hour in June 2005, or NZ$26.78 converting at purchasing power parity (PPP) of 1.0708. This includes allowances for on-costs such as superannuation, and administrative and capital overheads. A brief internet search appears to suggest that this a similar unit cost applies in New Zealand (see, for example, www.domestic.co.nz). At this unit cost, the total value of care provided was estimated as $3.60 billion in 2005. Inflating this estimate by wage growth over 2005 to 2010 (as per productivity losses) and by arthritis prevalence growth over 2005 to 2010 gives an estimate of **$5.04 billion in 2010. Of this, over 98.9% ($4.99 billion) is the replacement value of informal care and the remaining $55 million formal care provision**, as set out in Table 3.4.

While it is quite legitimate to use the replacement valuation estimate for formal community costs, for informal costs a (preferable) opportunity cost estimate is made by multiplying the

value of care by the average employment rate (in this case the 15% employment rate for those aged over 65). **The alternative opportunity cost measure is thus much lower (than $5.04 billion) at $752m in 2010.**

Table 3.4: Value of care provided to people with arthritis, New Zealand, 2005, 2010

	Rheumatoid arthritis	Osteo-arthritis	Other arthritis	All forms of arthritis, 2005	All forms of arthritis, 2010
Average hours per week					
Formal	3.5	3.4	2.9	3.1	
Informal	12.4	12.0	10.1	11.0	
% of people receiving care					
Formal	2.0	1.9	1.6	1.6	
Informal	50.0	48.3	40.8	44.4	
Total hours of care per year (million)					
Formal	0.4	0.9	0.2	1.5	
Informal	32.2	80.5	15.9	133.9	
Total	32.6	81.4	16.1	134.5	
$ value of care					
Formal	10	24	5	40	
Informal	863	2,156	427	3,562	
Total (replacement)	872	2,180	431	3,602	5,045
Total (opportunity)				**536.7**	**752.1**

Note: Components may not sum to totals due to rounding and the existence of people with arthritis of unknown type (see Chapter 1).

3.3 Other indirect costs

3.3.1 Deadweight losses from welfare payments

Duthie et al (2004) highlighted the 2001 New Zealand Disability Survey that collected data on arthritis as a cause of disability (Statistics New Zealand, 2002). This study found that arthritis was the main condition causing disability for 14% of the disabled population. In 2004 the NZ Department of Social Policy provided Invalid Benefits worth $976.1 million and Sickness Benefits worth $469.5 million (Ministry of Social Development, 2004). If arthritis accounts for 14% of these payments, the total welfare support to people due to arthritis was $202.4 million in 2003-04.

Without further information on the number of people with arthritis that do receive a benefit, the type, their financial and living arrangements and age, it is not possible to accurately project the amount of welfare payments that will be made to them this year. From 1996 to 2002 the number of recipients of invalid benefits whose most serious condition was a musculoskeletal complaint increased 97% or 13.8% per annum from 4,703 in 1996 to 9,274 in 2003. Over the same time the number of recipients of sickness benefit with a musculoskeletal condition increased 53%, although some of this rise may be attributable to coding changes in the mid 1990s (Ministry of Social Development, 2005). To remain conservative, in Access Economics (2005a) we merely inflated the 2003-04 estimate by 2.8% for expected inflation to June 2005.

On this basis, the total value of arthritis-related disability pensions in 2005 was estimated to be $208.1 million.

Recalling that invalid and sickness benefits are transfers, not real costs, they should not be included in the estimation of total costs. As with taxation forgone, welfare payments do, however, have associated real DWLs due to the distortions they impose on production patterns and the need to fund the administration of the welfare system. As in Section 3.1.3, these are estimated as 18% of the value of the transfers, so the total deadweight losses from welfare payments in 2005 was estimated to be $37.4m.

Inflating this estimate by wage growth over 2005 to 2010 (as per productivity losses) and by arthritis prevalence growth over 2005 to 2010 gives an estimate of **$52.4m in 2010.**

3.3.2 Aids, modifications and travel

There are also the costs of mobility aids, modifications to the homes of people with arthritis, travel to health services and other indirect costs of arthritis. There is a paucity of data on these costs, while noting that there is an allowance for medical aids and equipment in the scale-up factor for non-allocated health costs described in Section 2.7.

Walsh and Chappell (1999) conducted a survey on behalf of the Australian Department of Family and Community Services of 409 recipients of disability support pension who had a musculoskeletal impairment. The study estimated the additional expenditure of these people on personal care, home help, and other aids and appliances. Based on these data, Access Economics (2005) estimates the cost of formal (paid) community carers for Australian arthritis sufferers in 2004, and the costs of aids, modifications and travel associated with their condition. The ratio (1.164) of these latter costs to the formal care ($40m from Table 3.4) is used to derive an estimate here of the cost of aids, modifications and travel of $46.8m for New Zealanders with arthritis in 2005.

Inflating this estimate by wage growth over 2005 to 2010 (as per productivity losses) and by arthritis prevalence growth over 2005 to 2010 gives an estimate of **$65.6m in 2010.**

3.4 Summary of the financial costs of arthritis

The total real financial costs of arthritis are thus estimated to be $3.20bn in 2010, summarised in Table 3.5 and Figure 3.3.

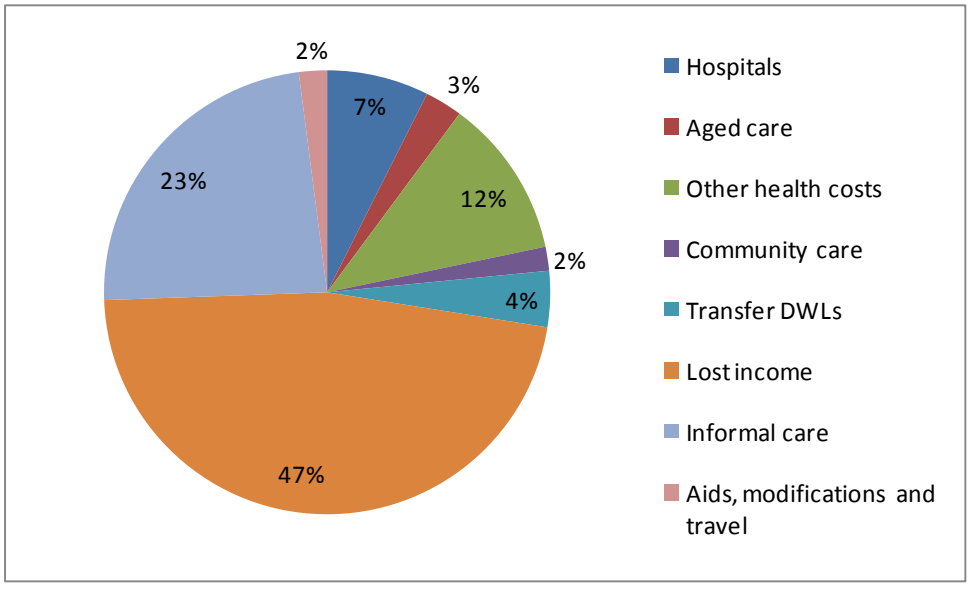
- Lost earnings are the largest cost item at $1.50bn (47% of the total).
- Informal sector care (measure on an opportunity cost basis) is second largest at 23% ($752m).
- Hospitals represent 7% of total costs, while residential age care is 3% and other health costs 12% of total costs.
- Community care and aids, modifications and travel are each around 2% of total costs at $55m and $66m respectively.
- The deadweight costs of welfare and taxation transfers comprise the remaining 4% ($130m).
- Indirect costs outweigh direct health costs around 3.6 to 1.

- **Annual costs per person with arthritis are $6,032, $731 for every New Zealander and 1.7% of GDP in total.**

Table 3.5: Arthritis, financial cost summary, 2010, $m

Cost element	Real cost	Transfer payment
Allocated health costs	$597.52	
Hospitals	$237.26	
Aged Care	$87.24	
Other allocated health	$273.02	
Unallocated health costs	$97.27	
Total health costs	**$694.79**	
Indirect financial costs		
Lost earnings (people with arthritis)	1,501.45	
Tax forgone (people with arthritis)	77.42	430.10
Opportunity cost of informal carers	752.06	
Welfare payments	52.41	291.60
Aids, modifications and travel	65.58	
Formal community care	55.49	
Sub-total indirect financial	**2,504.40**	
Total financial costs	**3,199.19**	**721.70**
Per person with arthritis	$6,032	$1,361
Per capita (population)	$731	$165
% GDP	1.69%	0.38%

Figure 3.3: Arthritis, financial cost summary, 2010, % total



Note: Components may not sum to totals due to rounding.

Access Economics' findings regarding New Zealand cost shares for arthritis concord well with the Australian results (Access Economics, 2005), noting that:

- Only the value of paid carers was included in the Australian study, so overall the estimated cost in New Zealand is higher (1.6% of GDP at that time, compared to 1.4% in Australia), as it also includes a valuation of informal care.

4 Burden of disease

The term 'burden of disease' refers to the impact of pain, suffering, disability and premature death resulting from disease and injury.

4.1 Suffering and premature death methodology

4.1.1 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 x%. 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) do not include any New Zealand studies in their meta-analysis (if they exist) but do include two Australian studies, notably Kniesner and Leeth (1991) and Miller et al (1997).

In our own review of international VSL studies (Access Economics, 2008), the average VSL from New Zealand studies was A$7 million, with a range of A$1.1-21.4 million (all in 2006 prices)[12]. This report uses the mean figure of A$7 million to estimate the value of the loss of wellbeing from dementia in New Zealand. This figure is converted to NZ$ using purchasing power parity between New Zealand and Australia for 2006 (NZ$1.08 = A$1)[13] and then inflated to 2010$NZ using New Zealand inflation data (2010 change from 2006 = 12.1%).

Based on this calculation (A2006$7 million × 1.08 × 1.121), **the estimated VSL for New Zealand for 2010 is NZ$8.5m**. This VSL estimate is in line with that of other eminent researchers (Nordhaus, 1999; Murphy and Topel, 1999; Cutler and Richardson, 1998).[14] The estimate is substantially higher than the conservative estimate used in Access Economics (2005a) of NZ$3.9m in 2005 – the low end of the range NZ$3.9 million to NZ$10.1m. Rather it is quite close to the mid-range estimate of NZ$6.9m from the 2005 study, inflated to 2010 prices. However, while this estimate reflects the New Zealand literature available to this point, due to the small number of New Zealand studies, the uncertainty surrounding this parameter and its large impact on costs, we use a more conservative estimate in the modelling (see Section 4.1.3).

4.1.2 DALYs and 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 Disability Adjusted Life Years (DALYs), with 0 representing a year of perfect health and 1 representing death (the converse of a QALY or 'quality-adjusted life year' where 1 represents perfect health). This approach was developed by the World Health Organization (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 Australian Institute for Health and Welfare (AIHW) with a separate comprehensive application in Victoria. Mathers et al (1999) from the AIHW estimate the burden of disease 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.

[12] The New Zealand studies are reported in Guria et al (1999); Hansen and Scuffham (1995); Leung and Guria (2006); Miller (2000); and Miller and Guria (1991).

[13] OECD, http://www.oecd.org/dataoecd/61/56/39653523.xls (accessed: 10 June 2008)

[14] Comparisons are provided in Access Economics (2003).

Martin Tobias and the New Zealand Burden of Disease Study (NZBDS) team utilised the global and Australian studies to estimate the burden of disease for New Zealand (Ministry of Health, 2001). Estimates of YLL, YLD and DALYs for over 100 conditions in nine age groups for both genders and two major ethnic groups (Mäori and non-Mäori) are provided for the year 1996.

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.

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.

4.1.3 Discount rate

Choosing an appropriate discount rate for present valuations in cost analysis is a subject of some debate, and can vary depending on which 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 near-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 New Zealand projects, we have settled upon the following as the preferred approach.

- **Positive time preference**: We use the long term nominal bond rate of 6.0% pa (from recent history in trading of NZ Government 10 year bonds) 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 of New Zealand has an agreement with the New Zealand government to pursue monetary policy that delivers 1% to 3% inflation on average over the medium term. Over the past few years inflation has consistently remained in the top half of this band, and is expected to remain above 2.5% until 2008 (New Zealand Treasury, 2005) and so we use an assumption of 2.2% pa for this variable. (It is important to allow for inflation in order to derive a real, rather than nominal, rate.)
- **Productivity growth**: The New Zealand Treasury expects labour productivity growth of around 2% per annum in the year to March 2007, before returning to its long-term trend of around 1.5% per annum (New Zealand Treasury, 2005). For New Zealand based disease costing, this estimate of 1.5% will be used. By way of comparison, in Australia the Commonwealth Government's Intergenerational report assumed productivity

growth of 1.7% in the decade to 2010 and 1.75% thereafter. Access Economics uses 1.75% for disease costing in Australia.

There are then two different discount rates that should be applied:

- To discount income streams of future earnings, the discount rate is:
  - 6.0 - 2.2 - 1.5 = 2.3%.
- To discount other future streams (healthy life, health services, legal costs, accommodation services and so on) the discount rate is:
  - 6.0 – 2.2 = 3.8%

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.

Annualising the VSL of NZ$8.5 million using the discount rate of 3.8% over an average 40 years expected life span (the average from the meta-analysis of wage-risk studies) provides an estimate of the value of a life year (VLY) of $415,569. However, because of the uncertainty of this figure and its large impact on costs, an alternative estimate is provided by converting the 'official' Australian estimate the VLY of A$151,000 from 2007 from the Australian Department of Finance and Deregulation[15] into 2010 NZ dollars. This provides a **lower estimate for the VLY of NZ$177,683 in 2010.** The lower estimate is used in the costing to retain conservatism. It is slightly lower than the VLY estimate used in our 2005 report, reflecting the switch to use of a government estimate.

4.2 Estimating the burden of disease for arthritis in 2005

The burden of disease for 2005 was based on the burden estimated by the Ministry of Health (2001) for 1996, inflated on the basis of the growth in arthritis prevalence over the period 1996 to 2005. The Ministry of Health reported selective statistics from the 1996 study, including that:

- Osteoarthritis has the 6th largest disability burden (YLD) in New Zealand;
- Musculoskeletal disease has five times the average disability:mortality (YLD:YLL) ratio and represents 3% of total DALYs, of which osteoarthritis accounts for two thirds; and
- Severe rheumatoid arthritis has the second highest disability weight in the NZBDS – 0.94, equal with severe dementia and just behind terminal phase AIDS (0.95).

YLLs and YLDs were only reported for osteoarthritis (by gender) and for all musculoskeletal disease (by gender and by age). Total DALYs for osteoarthritis, rheumatoid arthritis and all musculoskeletal conditions were reported by gender and by ethnicity (Mäori/non-Mäori). Unfortunately, it was not possible to obtain from the Ministry for Health a detailed breakdown of YLLs and YLDs by age, gender, ethnicity and type of arthritis.

[15] http://www.finance.gov.au/obpr/cost-benefit-analysis.html - see *Best Practice Regulation Guidance Note: Value of statistical life PDF version.*

Access Economics (2005), based on input from rheumatologists and the relative prevalence of conditions, estimated that around 51% of the burden of disease from musculoskeletal disease, other than osteoarthritis or rheumatoid arthritis, could be attributed to other forms of arthritis. We apply the same percentage here to estimate the pain and suffering associated with other forms of arthritis. The estimates are factored up to 2010 based on prevalence growth in arthritis between 2005 and 2010.

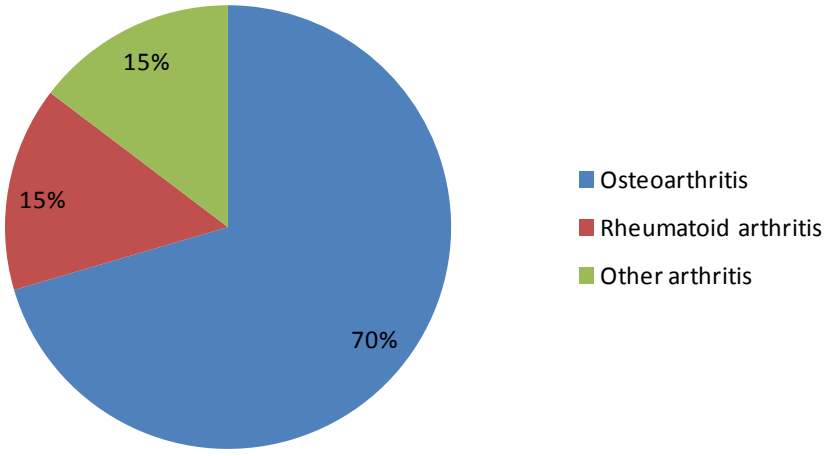
The total burden of disease for all forms of arthritis in 2010 is estimated as 21,491 DALYs.

Table 4.1: Burden of disease, DALYs by type of arthritis, New Zealand, 2010

DALYs	Male	Female	Mäori	Non-Mäori	Persons
Rheumatoid arthritis	958	2,238	357	2,838	3,195
Osteoarthritis	6,004	9,136	1,200	13,939	15,140
Other arthritis	1,143	2,013	315	2,841	3,156
Total arthritis	**8,105**	**13,386**	**1,873**	**19,619**	**21,491**

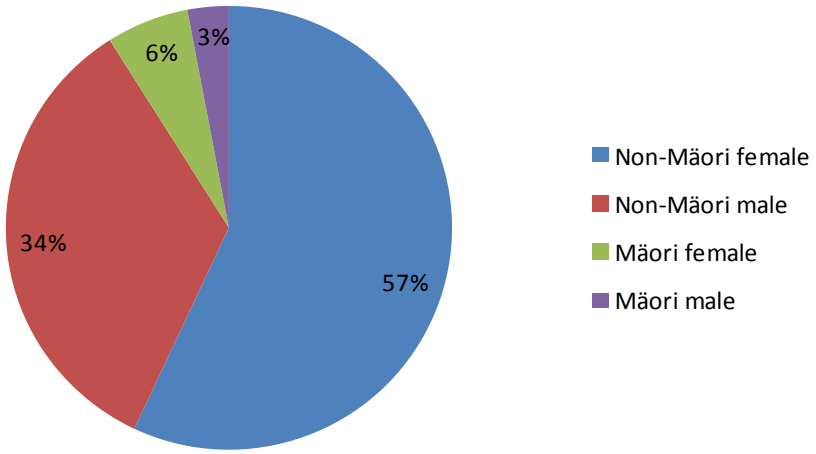
As Table 4.1 and Figure 4.1 show, the majority of the burden of disease (70% or 15,140 DALYs in 2010) is accounted for by osteoarthritis, the most common form of arthritis. Rheumatoid arthritis accounts for another 3,195 DALYs or 15% of total DALYs from arthritis.

Figure 4.1: Burden of disease by type of arthritis, NZ, 2010 (% 21,491 DALYs)



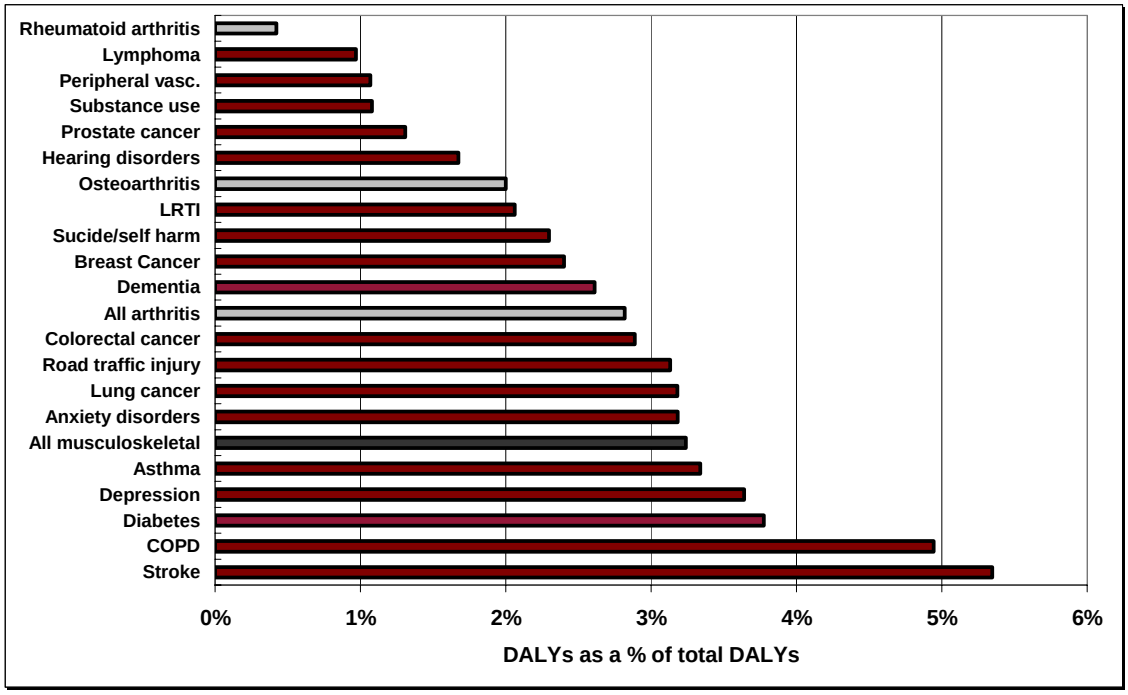
The majority of the burden of disease (63%, Figure 4.2) is borne by women, as would be expected from the higher prevalence of arthritis amongst females.

Figure 4.2: Burden of disease by gender and ethnicity, NZ, 2010 (% 21,491 DALYs)



It is also possible from the NZBDS data, while now quite old, to make comparisons with other disease categories, such as cardiovascular disease, cancer, injury, diabetes, asthma. In 1996 over 13% of the burden of disease in New Zealand was due to ischaemic heart disease. The next largest cause was stroke, responsible for 5.3% of all DALYs lost. Arthritis represents about 2.8% of the total burden of disease, more than breast cancer or dementia (Figure 4.3).

Figure 4.3: Comparison of burden of disease, New Zealand, 1996



Note: COPD = chronic obstructive pulmonary disease; LRTI = lower respiratory tract infection.

4.3 Valuing the burden of disease

Multiplying the burden of disease in DALYs (21,491) as derived in the preceding section by the value of a life year (VLY) from Section 4.1.3 of $177,683 provides a monetary measure of the

disability and premature mortality burden of arthritis. **The cost of disability and premature death from arthritis is estimated as $3.8 billion in 2010.**

In Access Economics (2005a) it was necessary to net out from this total the costs specific to arthritis that are borne by the individual. However, this time, this step is not required since the plug-in VLY is already a net estimate.

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Appendix A: NZHS prevalence data

Table A.1: NZ prevalence of all arthritis, OA and RA, by age & gender, 2006-07

	15-24	25-34	35-44	45-54	55-64	65-74	75+	Total
Has ever been diagnosed with arthritis								
Men	0.7 (0.2 -	1.6 (0.8 -	7.4 (5.4 -	15.7 (12.4 -	25.0 (21.5 -	32.4 (28.2 -	37.5 (32.9	13.0 (12.2
Women	1.6 (0.6 -	4.5 (2.6 -	4.9 (3.4 -	15.7 (12.9 -	28.1 (25.0 -	46.2 (42.3 -	53.7 (49.1	16.3 (15.4
Total	1.1 (0.6 -	3.1 (2.1 -	6.1 (4.8 -	15.7 (13.4 -	26.6 (24.4 -	39.5 (36.7 -	46.8 (43.2	14.8 (14.2
Has ever been diagnosed with osteoarthritis								
Men	N/A	0.5 (0.1 -	2.0 (1.2 -	8.0 (5.7 -	11.4 (8.5 -	20.2 (16.6 -	22.0 (18.0	6.5 (5.7 -
Women	0.0 (0.0 -	1.5 (0.7 -	1.6 (0.9 -	8.4 (6.3 -	18.9 (16.2 -	31.1 (27.0 -	40.5 (36.0	10.1 (9.3 -
Total	0.0 (0.0 -	1.0 (0.5 -	1.8 (1.2 -	8.2 (6.6 -	15.2 (13.3 -	25.8 (23.3 -	32.6 (29.4	8.4 (7.9 -
Has ever been diagnosed with rheumatoid arthritis								
Men	0.4 (0.0 -	0.5 (0.1 -	1.7 (0.8 -	2.2 (1.1 -	5.1 (3.5 -	6.7 (4.4 -	9.5 (6.7 -	2.7 (2.2 -
Women	1.3 (0.5 -	2.2 (1.2 -	2.2 (1.1 -	5.1 (3.4 -	6.8 (4.7 -	9.4 (6.5 -	9.0 (6.5 -	4.3 (3.6 -
Total	0.8 (0.4 -	1.4 (0.8 -	1.9 (1.2 -	3.7 (2.6 -	6.0 (4.5 -	8.1 (6.2 -	9.2 (7.3 -	3.5 (3.1 -

Source: http://www.moh.govt.nz/moh.nsf/pagesmh/7601/$File/arthritis-ch3.pdf and associated spreadsheets.

Table A.2: NZ prevalence of all arthritis, OA and RA, by gender & race, 2006-07

	Maori	Non-	Pacific	Non-	Asian	Non-
Has ever been diagnosed with arthritis						
Men	13.8 (11.1 -	10.7 (9.9 -	9.4 (6.1 -	10.9 (10.1 -	6.3 (4.4 -	11.2 (10.4 -
Women	13.6 (11.8 -	13.1 (12.1 -	10.3 (7.8 -	13.3 (12.4 -	10.1 (7.5 -	13.5 (12.5 -
Total	13.7 (12.0 -	11.9 (11.4 -	9.9 (7.9 -	12.1 (11.6 -	8.3 (6.7 -	12.4 (11.8 -
Has ever been diagnosed with osteoarthritis						
Men	6.4 (3.9 -	5.3 (4.6 -	2.3 (0.9 -	5.4 (4.7 -	1.0 (0.5 -	5.5 (4.9 -
Women	6.6 (5.3 -	7.8 (7.1 -	3.9 (2.2 -	7.9 (7.2 -	4.8 (2.8 -	8.0 (7.3 -
Total	6.5 (5.0 -	6.6 (6.2 -	3.2 (1.9 -	6.7 (6.3 -	3.0 (1.9 -	6.8 (6.4 -
Has ever been diagnosed with rheumatoid arthritis						
Men	2.6 (1.5 -	2.2 (1.8 -	2.5 (1.0 -	2.3 (1.8 -	2.1 (0.9 -	2.3 (1.8 -
Women	4.7 (3.4 -	3.6 (3.0 -	3.3 (1.4 -	3.7 (3.1 -	3.4 (1.9 -	3.8 (3.1 -
Total	3.7 (2.8 -	2.9 (2.5 -	2.9 (1.6 -	3.0 (2.6 -	2.8 (1.7 -	3.1 (2.6 -

Source: http://www.moh.govt.nz/moh.nsf/pagesmh/7601/$File/arthritis-ch3.pdf and associated spreadsheets.

Appendix B: Survey questions from the NZHS

1.28 **Have you ever been told by a doctor you have arthritis? Please include gout, lupus and psoriatic arthritis.** [Circle one]

1 Yes
5 No
.K Don't know → GO TO 1.34
.R Refused

1.29 **What kind of arthritis was that?** *One answer only* (*If respondent answers more than one kind, say:* **Which affects you most?**) [Circle one only]

1 Rheumatoid
2 Osteoarthritis
77 Other [specify]_____
.K Don't know
.R Refused

[Showcard 1.30]
1.30 **Looking at Card 1.30, which joints were affected first?** [Circle one]

1 Small joints like fingers or hands
2 Large joints like knees or hips
.K Don't know
.R Refused

1.31 **How old were you when you were first told by a doctor that you had arthritis?** [Record age or circle appropriate answer]

ⓘ If from birth record 0

[ ]
.R Refused
.K Don't know

1.32 **What treatments do you *now* have for arthritis?** [Circle all mentioned]

1 No treatment
2 Medicines, tablets, or pills
3 Exercise or physiotherapy
4 Injections
77 Other [specify]_____
.K Don't know
.R Refused

1.33 **Have you ever had an operation or surgery because of your arthritis?** [Circle one]

1 Yes
5 No
.K Don't know
.R Refused

Source: http://www.moh.govt.nz/moh.nsf/pagesmh/7683/$File/nzhs-adult-questionnaire-may08.pdf. Note the child questionnaire is at: http://www.moh.govt.nz/moh.nsf/pagesmh/7683/$File/nzhs-child-questionnaire-may08.pdf, but does not include questions on arthritis due to low prevalence in children.

Appendix C: – RNZCGPRU pharmaceutical and pathology data

Table C.1 presents the number of prescriptions and average daily dose for arthritis consultations and the corresponding number of prescriptions and average daily dose of these drugs in the general population, from the RNZCGPRU data purchase. Table C.2 presents the number of laboratory referrals for arthritis consultations and the corresponding number of referrals for these tests in the general population.

Table C.1: Prescriptions, arthritis consultations vs total population

	Number		% Total		Average daily dose	
Drug name	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)	Arthritis	Total (N-n)
Acitretin	1	0	0.02	0.00	25mg	
alendronate	11	535	0.27	0.17	10mg	39mg
Alfacalcidol	1	7	0.02	0.00		0.25mg
Alginic Acid	3	200	0.07	0.06	3000mg	2250mg
Allopurinol	21	1791	0.51	0.58	240mg	208mg
Amiloride with Hydrochlorothiazide	13	582	0.32	0.19	5mg	6.6mg
amiodarone	4	340	0.10	0.11	200mg	190mg
Amitriptyline	66	2234	1.61	0.72	30mg	28mg
Amlodipine	1	93	0.02	0.03		8mg
Amoxycillin	25	24861	0.61	8.03	1966mg	1652mg
Apomorphine	1	21	0.02	0.01		2.25mg
aqueous cream	15	1662	0.37	0.54	topical	topical
Ascorbic Acid	3	85	0.07	0.03	400mg	207mg
Aspirin	83	7994	2.03	2.58	336mg	174mg
Atenolol	21	2917	0.51	0.94	67mg	65mg
Atorvastatin	15	2263	0.37	0.73	27mg	26mg
Azatadine Maleate	1	45	0.02	0.01	1mg	1.5mg
Azathioprine	5	74	0.12	0.02	95mg	113mg
Baclofen	2	50	0.05	0.02	120mg	39mg
Beclomethasone Dipropionate	18	3229	0.44	1.04	260mcg	322mcg
Bendrofluazide	40	4692	0.98	1.52	3mg	2.7mg
Benztropine Mesylate	2	40	0.05	0.01		2.7mg
Betahistine	1	54	0.02	0.02	16mg	19mg
Betamethasone	14	1474	0.34	0.48		
Bezafibrate	13	1535	0.32	0.50	400mg	402mg
Bisacodyl	1	196	0.02	0.06	10mg	9.3mg
Budesonide	18	3506	0.44	1.13	420mcg	460mcg
Bumetanide	1	106	0.02	0.03	1mg	1.2mg
Calcipotriol	1	218	0.02	0.07		
Calcitriol	28	447	0.68	0.14	0.4mcg	0.5mcg
Calcium Carbonate	61	1458	1.49	0.47	1.8g	1.8g
Calcium Lactate-Gluconate	5	229	0.12	0.07	1g	1mg
Candesartan	6	770	0.15	0.25	11mg	24mg
Capsaicin	1	14	0.02	0.00		
Captopril	1	45	0.02	0.01		70.5mg
Carbamazepine	4	387	0.10	0.12	400mg	500mg
Cefaclor Monohydrate	3	2012	0.07	0.65	1000mg	952mg
celecoxib	87	769	2.13	0.25	213mg	222mg
Celiprolol	15	887	0.37	0.29	250mg	305mg
Cetirizine Hydrochloride	5	1313	0.12	0.42	10mg	10mg
Chloramphenicol	5	2839	0.12	0.92		3000mg
chlordiazepoxide	2		0.05	0.00		
chloroquine	1	7	0.02	0.00	400mg	400mg
Chlorpheniramine Maleate	1	1849	0.02	0.60		11mg

Drug name	Number		% Total		Average daily dose	
	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)	Arthritis	Total (N-n)
Ciclopiroxolamine	2	251	0.05	0.08		
Cilazapril	54	6994	1.32	2.26	4mg	3.3mg
Cimetidine	1	3	0.02	0.00		800mg
ciprofloxacin	1	117	0.02	0.04	1000mg	1020mg
Citalopram	11	1469	0.27	0.47	23mg	25mg
Clindamycin Phosphate	1	218	0.02	0.07		
Clobetasol	7	871	0.17	0.28		
Clonazepam	13	691	0.32	0.22	1.5mg	1.6mg
clonidine	5	182	0.12	0.06	133mcg	69mcg
clotrimazole	6	1192	0.15	0.38	40mg	231mg
codeine	53	1312	1.29	0.42	93mg	98.5mg
Colchicine	10	446	0.24	0.14	1.35mg	1145mcg
Colecalciferol	4	149	0.10	0.05	1.25mg	1.25mg
Co-Trimoxazole	6	2720	0.15	0.88	2400mg	2500mg
Cyclizine Hydrochloride	1	15	0.02	0.00	150mg	144mg
Cyclopenthiazide	11	453	0.27	0.15	0.5mg	0.5mg
cyclosporin	5	35	0.12	0.01		112mg
Cyproheptadine Hydrochloride	1	39	0.02	0.01	8mg	8mg
Dexamethasone	7	1995	0.17	0.64		27.5mg
Dextropropoxyphene wp*	141	3130	3.44	1.01	420mg	429mg
Diazepam	13	1192	0.32	0.38	8mg	8.6mg
diclofenac sodium	392	10198	9.58	3.29	139mg	140.5mg
Dicloxacillin	1	49	0.02	0.02	2000mg	1548mg
diethylpropion	1	91	0.02	0.03		77mg
Diflucortolone Valerate	3	165	0.07	0.05		150mg
Digoxin	4	1043	0.10	0.34	125mcg	158mcg
Dihydrocodeine Tartrate	25	381	0.61	0.12	152mg	150mg
Diltiazem	19	1896	0.46	0.61	237mg	195mg
Diphenoxylate Hydrochloride wp*	2	119	0.05	0.04		4mg
Dipyridamole	4	381	0.10	0.12	300mg	286mg
disodium etidronate	1	47	0.02	0.02	400mg	400mg
Docusate Sodium	7	840	0.17	0.27	50mg	164mg
Domperidone	3	162	0.07	0.05	47mg	32mg
donepezil	1	15	0.02	0.00	5mg	9mg
Dothiepin Hydrochloride	13	429	0.32	0.14	71mg	63mg
Doxazosin Mesylate	11	1472	0.27	0.48	2.25mg	4mg
doxepin Hydrochloride	9	749	0.22	0.24	15mg	42mg
doxycycline Hydrochloride	10	4751	0.24	1.53	117mg	130mg
ear drops	1	120	0.02	0.04		
Eformoterol fumarate	6	932	0.15	0.30	24mcg	15.7mcg
Emulsifying Ointment BP	1	426	0.02	0.14		
enalapril	3	615	0.07	0.20	20mg	12.9mg
Erythromycin Ethyl Succinate	2	3568	0.05	1.15	1600mg	1455mg
Ethinyloestradiol	11	1692	0.27	0.55	258mcg	37mcg
Ethynodiol Diacetate	3	798	0.07	0.26	500mcg	512mcg
Etidronate Disodium	37	1049	0.90	0.34	400mg	400mg
etofenamate	3	39	0.07	0.01		
etoricoxib	36	323	0.88	0.10	82.5mg	92mg
eye drops	4	49	0.10	0.02		
Famotidine	5	199	0.12	0.06	80mg	41mg
Felodipine	28	3265	0.68	1.05	5.3mg	6mg
FERROUS sulphate	9	929	0.22	0.30		313mg
Fexofenadine	1	84	0.02	0.03	120mg	117mg
flucloxacillin	8	4592	0.20	1.48	1429mg	3536mg
Fluconazole	1	34	0.02	0.01	50mg	135mg

Drug name	Number		% Total		Average daily dose	
	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)	Arthritis	Total (N-n)
Fluocortolone Caproate with Fluocortolone Pivalate	1	88	0.02	0.03		
Fluoxetine Hydrochloride	11	2945	0.27	0.95	28mg	23mg
Fluticasone	24	5978	0.59	1.93	475mcg	395mcg
folic acid	56	833	1.37	0.27	3mg	3mg
Frusemide	29	3228	0.71	1.04	55mg	54mg
Fusidic Acid	9	3838	0.22	1.24		42.5mg
Gliclazide	5	1084	0.12	0.35	120mg	166mg
Glipizide	1	482	0.02	0.16		13mg
glucosamine	1	1	0.02	0.00	1500mg	1500mg
Glucose Oxidase	9	1693	0.22	0.55		
Glyceryl Trinitrate	4	770	0.10	0.25		483mg
Haloperidol	1	80	0.02	0.03	1.5mg	3.6mg
Hydrocortisone	52	9337	1.27	3.02	topical	65mg
hydrogen peroxide	1		0.02	0.00		
Hydroxocobalamin	9	669	0.22	0.22		430mg
hydroxychloroquine	20	56	0.49	0.02	277mg	295mg
Hyoscine N-Butylbromide	2	642	0.05	0.21	80mg	47mg
Hypromellose	4	82	0.10	0.03		
Ibuprofen	123	4257	3.01	1.37	1268mg	1090mg
Imipramine	1	132	0.02	0.04		54mg
Indapamide	1	124	0.02	0.04	2.5mg	2.5mg
Indomethacin	20	307	0.49	0.10	106mg	129mg
insulin	11	390	0.27	0.13		
Ipratropium Bromide	8	954	0.20	0.31	100mcg	202mcg
Isosorbide Mononitrate	13	1723	0.32	0.56	61mg	60mg
Itraconazole	2	256	0.05	0.08	400mg	308mg
Ketoconazole	5	524	0.12	0.17		280mg
Ketoprofen	7	65	0.17	0.02	200mg	185mg
Ketotifen	2	291	0.05	0.09		
Lactulose	14	1153	0.34	0.37		
Latanoprost	2	99	0.05	0.03		
Laxatives	16	1002	0.39	0.32	2125mg	4125mg
Leflunomide	5	8	0.12	0.00	16mg	19mg
Levobunolol	1	1	0.02	0.00		
levodopa	3	59	0.07	0.02		462mg
Lisinopril	2	120	0.05	0.04	7.5mg	12mg
Loperamide Hydrochloride	6	869	0.15	0.28	2mg	4.7mg
Loratadine	8	3221	0.20	1.04	10mg	10mg
Lorazepam	8	758	0.20	0.24	3mg	2mg
Losartan	1	58	0.02	0.02	12.5mg	70mg
Medroxyprogesterone Acetate	3	289	0.07	0.09	30mg	13mg
Megestrol Acetate	1	5	0.02	0.00	160mg	160mg
Meloxicam	23	246	0.56	0.08	7.5mg	8.3mg
Mesalazine	1	169	0.02	0.05	3000mg	2445mg
Metformin Hydrochloride	12	2308	0.29	0.75	1461mg	1511mg
Methotrexate	77	109	1.88	0.04	10mg	10mg
Methotrimeprazine	1	52	0.02	0.02	12.5mg	22mg
Metoclopramide Hydrochloride	7	1884	0.17	0.61	30mg	28mg
Metoprolol	24	4350	0.59	1.40	74mg	81mg
Metronidazole	3	155	0.07	0.05		13mg
Mexiletine Hydrochloride	2	24	0.05	0.01	300mg	455mg
miconazole	6	1233	0.15	0.40	40mg	153mg
Midazolam	1	142	0.02	0.05		9mg
Minocycline Hydrochloride	4	501	0.10	0.16	50mg	97mg
Misoprostol	1	4	0.02	0.00		400mg

Drug name	Number		% Total		Average daily dose	
	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)	Arthritis	Total (N-n)
Moclobemide	1	66	0.02	0.02	300mg	434mg
Mometasone Furoate	5	1111	0.12	0.36		
Morphine	19	445	0.46	0.14	73mg	55mg
Mucopolysaccharide Polysulphuric Acid Ester	2	130	0.05	0.04		
Mupirocin	7	1394	0.17	0.45		
Nadolol	1	12	0.02	0.00		60mg
Naphazoline	2	66	0.05	0.02		
Naproxen	122	2524	2.98	0.82	904mg	992mg
nasal spray	10	583	0.24	0.19		
Nefopam Hydrochloride	5	114	0.12	0.04	135mg	146mg
neocytamen	1	16	0.02	0.01		
Nifedipine	2	120	0.05	0.04		34mg
Nitrazepam	4	125	0.10	0.04	10mg	8mg
Nitroglycerin	1	160	0.02	0.05		
Norethisterone	2	217	0.05	0.07	1.25mg	14mg
Norfloxacin	5	2106	0.12	0.68	800mg	798mg
nortriptyline hydrochloride	3	587	0.07	0.19		34mg
Nystatin	3	294	0.07	0.09		30mg
Oestradiol	3	339	0.07	0.11		328mcg
Oestriol	10	810	0.24	0.26	334mcg	1340mcg
Oestrogens	19	826	0.46	0.27	560mcg	656mcg
Olsalazine	1	8	0.02	0.00		833mg
Omeprazole	156	7282	3.81	2.35	26mg	26mg
Orphenadrine	13	775	0.32	0.25	200mg	196mg
Oxazepam	8	407	0.20	0.13	10mg	23mg
Oxprenolol	2		0.05	0.00	100mg	
Oxybutynin	10	560	0.24	0.18	7mg	8mg
Pantoprazole	37	1753	0.90	0.57	35mg	37mg
Paracetamol	271	15937	6.62	5.15	3541mg	3592mg
Paracetamol with Codeine	75	3078	1.83	0.99	3723mg + 60mg	2963mg +
Paraffin Liquid	1	10	0.02	0.00		
Paroxetine Hydrochloride	10	2851	0.24	0.92	20	23mg
penicillin	1	343	0.02	0.11		
Pethidine	2	92	0.05	0.03	100mg	125mg
Phenoxymethylpenicillin	4	1445	0.10	0.47	1000mg	1558mg
Phentermine	2	214	0.05	0.07	30mg	27mg
Phenylephrine Hydrochloride	1	28	0.02	0.01		
Phenytoin Sodium	3	216	0.07	0.07	230mg	225mg
Pholcodine	3	1758	0.07	0.57		
Pilocarpine	2	18	0.05	0.01		
Pindolol	1	128	0.02	0.04	20mg	12mg
Piroxicam	16	286	0.39	0.09	20mg	24mg
Pizotifen	2	228	0.05	0.07		0.9mg
Polyvinyl Alcohol	3	210	0.07	0.07		
Potassium Chloride	12	803	0.29	0.26	1200mg	1541mg
Povidone Iodine	4	393	0.10	0.13		
Prazosin	1	62	0.02	0.02		5mg
Prednisone	103	4654	2.52	1.50	18mg	30mg
Primidone	1	13	0.02	0.00		542mg
Prochlorperazine	14	1811	0.34	0.58	14mg	14mg
Progesterone	1	105	0.02	0.03		60mg
Promethazine Hydrochloride	3	1060	0.07	0.34	50mg	28mg
Propranolol	4	131	0.10	0.04		63mg
Pseudoephedrine	1	937	0.02	0.30		175mg
pyridoxine	2	230	0.05	0.07	100mg	98mg

Drug name	Number		% Total		Average daily dose	
	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)	Arthritis	Total (N-n)
Quinapril	46	3890	1.12	1.26	16mg	17mg
Quinine	13	816	0.32	0.26	319mg	280mg
Ranitidine	19	1536	0.46	0.50	257mg	304mg
Rifampicin	1	9	0.02	0.00		563mg
rofecoxib	95	776	2.32	0.25	20mg	25mg
Roxithromycin	3	463	0.07	0.15	300mg	302mg
Salbutamol	42	9558	1.03	3.09	540mcg	486mcg
Salmeterol	8	426	0.20	0.14	100mcg	91mcg
Selegiline	1	8	0.02	0.00		5mg
Senna	1	32	0.02	0.01		
sibutramine	2	199	0.05	0.06	10mg	11mg
sildenafil	2	424	0.05	0.14	75mg	80mg
Simethicone	2	155	0.05	0.05		
Simvastatin	65	7360	1.59	2.38	29mg	28mg
Sodium Aurothiomalate	5	3	0.12	0.00		
Sodium Citro-Tartrate	1	162	0.02	0.05		
Sodium Cromoglycate	3	526	0.07	0.17		
Sodium Valproate	3	538	0.07	0.17	933mg	860mg
Sotalol	5	466	0.12	0.15	133mg	163mg
Spironolactone	10	882	0.24	0.28	25mg	56mg
sulfamethoxazole	1	55	0.02	0.02	1920mg	1868mg
Sulindac	5	40	0.12	0.01	300mg	295mg
Sulphasalazine	27	99	0.66	0.03	1962mg	2011mg
Sumatriptan	2	675	0.05	0.22	50mg	77mg
Syringe	4	170	0.10	0.05		
tadalafil	1	168	0.02	0.05	20mg	20mg
Tamoxifen Citrate	3	176	0.07	0.06	15mg	20mg
Tar with Triethanolamine Lauryl Sulphate and Fluor	5	267	0.12	0.09		
Temazepam	15	1230	0.37	0.40	14mg	16mg
Tenoxicam	67	709	1.64	0.23	20mg	20mg
Terazosin Hydrochloride	8	876	0.20	0.28	3mg	4mg
Terbinafine	1	409	0.02	0.13	250mg	248mg
Terbutaline Sulphate	4	1413	0.10	0.46	250mcg	1035mcg
Thyroxine	40	3500	0.98	1.13	94mcg	83mcg
Tiaprofenic Acid	6	87	0.15	0.03	1000mg	524mg
Timolol	2	101	0.05	0.03	10mg	19mg
Tioconazole	1	55	0.02	0.02		
Tolterodine	1	96	0.02	0.03	2mg	3mg
topical skin	10	473	0.24	0.15		
Tramadol	44	948	1.08	0.31	188mg	194mg
Tranexamic Acid	1	129	0.02	0.04		3407mg
triamcinolone Acetonide	80	877	1.95	0.28	topical	17mg
Triamterene	2	45	0.05	0.01		60mg
Triazolam	15	706	0.37	0.23	250mcg	214mcg
Trifluoperazine Hydrochloride	2	81	0.05	0.03		4mg
Trimethoprim	4	2137	0.10	0.69		351mg
Urea	10	515	0.24	0.17		
Valdecoxib	1	11	0.02	0.00	20mg	31mg
Verapamil	5	409	0.12	0.13	80mg	220mg
Vitamin B Complex	2	68	0.05	0.02		
Vitamins	27	1193	0.66	0.39		
warfarin sodium	14	1668	0.34	0.54	4.5mg	3.4mg
Xylometazoline Hydrochloride	1	561	0.02	0.18		
Zopiclone	43	2822	1.05	0.91	9.5mg	8mg

*wp = with paracetamol

Table C.2: Laboratory referrals, arthritis consultations vs total population

Lab test type	Number		% Total	
	Arthritis	Total (N-n)	% Arthritis	% Total (N-n)
absolute retic count	2	127	0.02	0.03
Alanine Aminotransferase	185	11257	2.15	2.32
Albumin	193	11857	2.24	2.45
Albumin-to-Creatinine ratio	16	1330	0.19	0.27
alkaline phosphatase	184	10960	2.14	2.26
Alpha Fetoprotein	1	10	0.01	0.00
Amylase	4	545	0.05	0.11
Anisocytosis	3	112	0.03	0.02
Anti Nuclear Antibodies	91	526	1.06	0.11
antibodies - adrenal gland	1	8	0.01	0.00
Antibody	20	80	0.23	0.02
antibody - parietal cell	13	78	0.15	0.02
antibody - smooth muscle	13	78	0.15	0.02
antibody test – RNP	20	79	0.23	0.02
antibody test - salivary gland	1	8	0.01	0.00
antibody test - SCL-70	20	82	0.23	0.02
antibody test - SM (anti smith)	20	79	0.23	0.02
antibody test - SS-A/Ro	20	78	0.23	0.02
antibody test - SS-B/La	20	78	0.23	0.02
Antibody test - strep A	5	69	0.06	0.01
antideoxyribonuclease B	4	46	0.05	0.01
Anti-dsDNA antibodies	51	388	0.59	0.08
Anti-Neutrophilic Cytoplasmic Antibody	4	5	0.05	0.00
anti-neutrophillic cytoplasmic antibody	2	21	0.02	0.00
Antinuclear Antibody Test	39	174	0.45	0.04
Anti-Streptokinase	6	61	0.07	0.01
antithyroid peroxidase antibody	1	13	0.01	0.00
arsenic – urine	1	11464	0.01	2.37
Aspartate Aminotransferase	184	11	2.14	0.00
Basophils	331	17783	3.84	3.67
Bilirubin	184	11081	2.14	2.29
Biochemistry	1	34	0.01	0.01
blood group	1	127	0.01	0.03
brucella screen	1	8	0.01	0.00
Calcium	87	4035	1.01	0.83
Chlamydia	2	2197	0.02	0.45
Cholesterol	245	28653	2.84	5.92
Complement Activity	2	8	0.02	0.00
complete blood count	4	65	0.05	0.01
C-Reactive Protein	227	3402	2.63	0.70
Creatinine	210	13008	2.44	2.69
Cryoglobulin	1	91	0.01	0.02
Cytomegalovirus	2	38	0.02	0.01
D-dimer	2	16	0.02	0.00
Digoxin	1	15	0.01	0.00
Endomysial Antibodies	2	18231	0.02	3.76
Eosinophil antibodies	343	679	3.98	0.14
epstein-barr antibody	8	8396	0.09	1.73
Erythrocyte sedimentation rate	268	216	3.11	0.04
extractable nuclear antigens	12	4194	0.14	0.87
fasting status	45	49	0.52	0.01
Fecal Occult Blood Test	1	8319	0.01	1.72
Ferritin	82	1377	0.95	0.28
fluoride glucose	14	4162	0.16	0.86

	Number		% Total	
Folate	41	512	0.48	0.11
Follicle-stimulating hormone	3	11109	0.03	2.29
Gamma-glutamyl transpeptidase	182	8	2.11	0.00
Gastric Parietal Antibodies	1	10	0.01	0.00
gliadin antibody	4	9579	0.05	1.98
Globulin	168	6102	1.95	1.26
Glucose	78	21553	0.91	4.45
glycosylated haemoglobin	366	196	4.25	0.04
Haematology	6	47	0.07	0.01
hepatitis B surface antigen	10	1084	0.12	0.22
Hepatitis C antibody	2	193	0.02	0.04
Human leukocyte antigen	2	6	0.02	0.00
Hypochromic cells	1	29	0.01	0.01
IgA antibody	3	233	0.03	0.05
IgG antibody	3	190	0.03	0.04
Immunoglobulin	15	409	0.17	0.08
INR/Prothrombin	18	2964	0.21	0.61
iron saturation	113	12057	1.31	2.49
iron serum	23	2264	0.27	0.47
Ketones	1	36	0.01	0.01
Lactate dehydrogenase	2	222	0.02	0.05
Large Unstained Cells	1	18	0.01	0.00
Last Menstrual Period	1	30	0.01	0.01
Leukocytes	371	19693	4.31	4.07
liver function test	4	48	0.05	0.01
Luteinizing hormone	3	446	0.03	0.09
Lymphocytes	344	18586	3.99	3.84
Macrocytes	3	65	0.03	0.01
Magnesium	2	162	0.02	0.03
mean cell haemoglobin	81	6067	0.94	1.25
mean cell volume	83	6297	0.96	1.30
Mean corpuscular hemoglobin	256	12141	2.97	2.51
Mean corpuscular hemoglobin concentration	38	2277	0.44	0.47
Mean corpuscular volume	256	12141	2.97	2.51
mean platelet volume	407	22756	4.72	4.70
mitochondrial antibody	17	97	0.20	0.02
Monocytes	344	18575	3.99	3.84
Neutrophils	344	18581	3.99	3.84
Nitrates	1	16	0.01	0.00
Oestradiol	2	136	0.02	0.03
Packed cell volume	339	18406	3.93	3.80
Parathyroid Hormone	1	11	0.01	0.00
paul Bunnell	2	219	0.02	0.05
PCR	1	2	0.01	0.00
pH	1	46	0.01	0.01
Phosphate	15	1388	0.17	0.29
Phosphorus	11	464	0.13	0.10
Potassium	164	10858	1.90	2.24
pregnancy test	1	186	0.01	0.04
Progesterone	2	185	0.02	0.04
Prolactin	2	280	0.02	0.06
Prostate Specific Antigen	35	2098	0.41	0.43
Radiologist	6	498	0.07	0.10
red blood cells - normochromic	1	55	0.01	0.01
Red blood count	118	6330	1.37	1.31
Red cell distribution width	74	3940	0.86	0.81
red cell folate	9	1360	0.10	0.28
renal function	1	23	0.01	0.00

	Number		% Total	
Reticulocyte Count	3	294	0.03	0.06
Rhesus factor	4	143	0.05	0.03
Rheumatoid Factor	203	1016	2.36	0.21
Saturated I.C.P.	8	642	0.09	0.13
Sodium	165	10828	1.92	2.24
specific gravity	1	16	0.01	0.00
target cells	1	24	0.01	0.00
Thyroglobulin antibody	1	13	0.01	0.00
thyroid-stimulating hormone	92	8570	1.07	1.77
Thyroxine	44	4381	0.51	0.90
Total iron-binding capacity	34	2607	0.39	0.54
total protein	187	11404	2.17	2.35
Toxoplasma	4	83	0.05	0.02
Transferrin	2	229	0.02	0.05
Triiodothyronine	19	1380	0.22	0.28
Urea	216	8678	2.51	1.79
Urine	2	31	0.02	0.01
VCA antigen	5	735	0.06	0.15
vitamin B12	41	4178	0.48	0.86
Xray	1	0	0.01	0.00

Source: RNZCGPRU.

Appendix D: – Health data surveys

Arthritis New Zealand supplied contact details for the supplementary health survey data, with the task of ensuring adequate representation in terms of demographic and regional characteristics, as outlined below.

- **Outpatient and imaging services**, from the 21 District Health Boards
  - Bay of Plenty
  - Canterbury
  - Central Auckland
  - Gisborne/Tairawhiti
  - Hawke's Bay
  - Hutt Valley
  - Manawatu
  - Nelson Marlborough
  - Northland
  - North Shore, Rodney and Waitakere
  - Otago
  - Rotorua
  - South Auckland
  - South Canterbury
  - Southland
  - Taranaki
  - Waikato
  - Wairarapa
  - Wanganui
  - Wellington
  - West Coast
- **Aged care facilities** – these were selected randomly from an internet search using google.nz, yellowpages.co.nz and the NZS business search (names of facilities are not reported for privacy reasons).
- **Specialists** – the New Zealand Rheumatology Association Executive comprised the necessary 10 rheumatologists surveyed, being gender mixed, public and private and geographically diverse. The New Zealand Orthopaedic Association provided contact details for 14 other specialist members.
- **Allied health** – 22 physiotherapists were randomly selected from the NZ Society of Physiotherapists website, together with 6 occupational therapists from the NZ Association of Occupational Therapists.

Surveys were designed with professional assistance from Dangar Research. The final survey forms follow (reverse pages are very similar so are not repeated). Surveys were emailed with a

fortnight turnaround requested. Responses are summarised in the main body of the text relating to each costing.

Arthritis New Zealand Survey of Outpatient Services 2005

Definitions: Arthritis includes the conditions listed on the next page.
THIS SURVEY EXCLUDES HOSPITAL INPATIENT SERVICES.
If you have any concerns or questions about this survey or how to fill out responses to certain questions, please contact Lynne Pezzullo or Annette Lancy: 61-2-6273 1222

Question 1
What outpatient services do you provide for people with arthritis?
Please tick as many as apply.
1 ☐ specialist medical services
2 ☐ physiotherapy
3 ☐ occupational therapy
4 ☐ counselling
5 ☐ other, please specify_____

FOR THE SPECIALIST MEDICAL SERVICES
Question 2
In the most recent <u>year</u>, how many hours would you estimate that your specialists have provided services to *people with arthritis* who were NOT inpatients, to treat their arthritis?

_____non-inpatient hours per year

Question 3
What do you estimate is the average *cost per hour* of your specialist services?
Please provide for the most recent period available:

Specialist medical consultations: $_____per hour

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

FOR THE OTHER (ALLIED HEALTH) SERVICES
Question 4
In the most recent <u>year</u>, how many hours would you estimate that your allied health workers have provided services to *people with arthritis* who were NOT inpatients, to treat their arthritis?

_____non-inpatient hours per year

Question 5
What do you estimate is the average *cost per hour* of your allied health services?
Please provide for the most recent period available:

Allied health services: $_____per hour

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

Questions 6
How many beds are there in your facility?
Please exclude closed beds.

_____beds

Arthritic conditions included in this survey, by International Classification of Disease (Tenth Revision) category

M00 Pyogenic arthritis
M01 Direct infections of joint in infectious and parasitic diseases classified elsewhere
M02 Reactive arthropathies
M03 Postinfective and reactive arthropathies in diseases classified elsewhere
M05 Seropositive rheumatoid arthritis
M06 Other rheumatoid arthritis
M07 Psoriatic and enteropathic arthropathies
M08 Juvenile arthritis
M09 Juvenile arthritis in diseases classified elsewhere
M10 Gout
M11 Other crystal arthropathies
M12 Other specific arthropathies
M13 Other arthritis
M14 Arthropathies in other diseases classified elsewhere
M15 Polyarthrosis
M16 Coxarthrosis [arthrosis of hip]
M17 Gonarthrosis [arthrosis of knee]
M18 Arthrosis of first carpometacarpal joint
M19 Other arthrosis
M30 Polyarteritis nodosa and related conditions
M31 Other necrotizing vasculopathies
M32 Systemic lupus erythemastosus
M34 Systemic sclerosis
M35.0 Sicca syndrome [Sjögren]
M35.1 Other overlap syndromes
M35.3 Polymyalgia rheumatica
M45 Ankylosing spondylitis
M46 Other inflammatory spondylopathies
M47 Spondylosis
M48.0 Spinal stenosis
M48.1 Ankylosing hyperostosis [Forestier]
M49 Spondylopathies in diseases classified elsewhere
M65 Synovitis and tenosynovitis
M68 Disorders of synovium and tendon in diseases classified elsewhere
M70.0 Crepitant synovitis (acute) (chronic) of hand and wrist
M71.2 Synovial cyst of popliteal space [Baker]
M75.0 Adhesive capsulitis of shoulder
M76 Enthesopathies, lower limb, excluding foot
M77.2 Periarthritis of wrist
M77.3 Calcaneal spur
M77.5 Other enthesopathy of foot
M77.8 Other enthesopathies, not elsewhere classified
M77.9 Enthesopathy, unspecified

Many thanks for taking the time to complete this confidential survey.

Survey conducted by Access Economics Pty Ltd on behalf of Arthritis New Zealand.

Please return this survey either:
By email to: Lynne.Pezzullo@AccessEconomics.com.au

OR by fax to:
61-2-6273 1223

OR by post to:
Lynne Pezzullo, Senior Economist, Access Economics
PO Box 6248 Kingston ACT 2604 AUSTRALIA

Arthritis New Zealand Survey of Diagnostic Imaging Services 2005

Definitions: Arthritis includes the conditions listed on the next page.
If you have any concerns or questions about this survey or how to fill out responses to certain questions, please contact Lynne Pezzullo or Annette Lancy: 61-2-6273 1222

Question 1
In the most recent year, how many hours would you estimate that you have provided diagnostic imaging services to *people with arthritis*, in relation to their arthritis?

_____ hours per year

Question 2
What do you estimate is the average *cost per hour* of your diagnostic imaging services?
Please provide for the most recent period available:

Diagnostic imaging: $_____per hour

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

Many thanks for taking the time to complete this confidential survey.

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Arthritis New Zealand Survey of Aged Care Facilities 2005

Definitions: Arthritis includes the conditions listed on the next page.
THIS SURVEY EXCLUDES HOSPITAL INPATIENT OR OUTPATIENT SERVICES.
If you have any concerns or questions about this survey or how to fill out responses to certain questions, please contact Lynne Pezzullo or Annette Lancy: 61-2-6273 1222

Question 1
In the most recent year, what proportion of your facility's residents do you estimate are in care PRIMARILY because of their arthritis?

_____%

Question 2
In the most recent year, what proportion of your facility's residents do you estimate who HAVE arthritis, although they may be in care primarily for other reasons?

_____%

Question 3
What are the total annual costs of your facility? Note: Costs would equate to the total expenditure or total income side of the balance sheet, whichever is larger.
Please provide for the most recent period available:

Aged care services: $_____per annum

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

Question 4
How many beds are there in your facility?
Please exclude closed beds.

_____beds

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OR by post to:
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Arthritis New Zealand Survey of Arthritis Specialist Services 2005

Definitions: Arthritis includes the conditions listed on the next page.
THIS SURVEY EXCLUDES HOSPITAL INPATIENT OR OUTPATIENT SERVICES.
If you have any concerns or questions about this survey or how to fill out responses to certain questions, please contact Lynne Pezzullo or Annette Lancy: 61-2-6273 1222

Question 1
What is your specialty?
Please tick as many as apply.
1 ☐ rheumatology
2 ☐ orthopaedic surgery
3 ☐ other, please specify_____

Question 2
In the most recent <u>year</u>, how many hours would you estimate that you have provided specialist services to *people with arthritis*, to treat their arthritis, NOT through a hospital inpatient or outpatient service?

_____non-hospital hours per year

Question 3
What do you estimate is the average *cost per hour* of your specialist services? Note: Cost would equate to the price charged in private practice or to hourly salary (including on-costs such as superannuation) in other care settings.
Please provide for the most recent period available:

specialist medical consultations: $_____per hour

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

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PO Box 6248 Kingston ACT 2604 AUSTRALIA

Arthritis New Zealand Survey of Allied Health Services 2005

Definitions: Arthritis includes the conditions listed on the next page.
THIS SURVEY EXCLUDES HOSPITAL INPATIENT OR OUTPATIENT SERVICES.
If you have any concerns or questions about this survey or how to fill out responses to certain questions, please contact Lynne Pezzullo or Annette Lancy: 61-2-6273 1222

Question 1
What is your specialty?
Please tick as many as apply.
1 ☐ physiotherapy
2 ☐ occupational therapy
3 ☐ other, please specify_____

Question 2
In the most recent year, how many hours would you estimate that you have provided services to *people with arthritis*, to treat their arthritis, NOT through a hospital inpatient or outpatient service?

_____non-hospital hours per year

Question 3
What do you estimate is the average *cost per hour* of your services? Note: Cost would equate to the price charged in private practice or to hourly salary (including on-costs such as superannuation) in other care settings.
Please provide for the most recent period available:

Allied health services: $_____per hour

share paid by the patient or private health insurance fund _____%

share paid by other funding sources?_____%

Many thanks for taking the time to complete this confidential survey.

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